Index to 1981 NASA Tech Briefs

Volume 6, Numbers 1-4 **July 1986**


Electronic Components and Circuits


Electronic Systems


Physical Sciences


Materials


Computer Programs


Mechanics


Machinery


Fabrication Technology


Mathematics and Information Sciences


Life Sciences

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INTRODUCTION

Tech Briefs are short announcements of new technology derived from the research and development activities of the National Aeronautics and Space Administration. These briefs emphasize information considered likely to be transferrable across industrial, regional, or disciplinary lines and are issued to encourage commercial application.

This *Index to NASA Tech Briefs* contains abstracts and four indexes — subject, personal author, originating Center, and Tech Brief number — for 1981 Tech Briefs.

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Originating Center Prefixes

ARC	Ames Research Center
GSC	Goddard Space Flight Center
HQN	NASA Headquarters
KSC	Kennedy Space Center
LAR	Langley Research Center
LEW	Lewis Research Center
MFS	Marshall Space Flight Center
MSC	Johnson Space Center (formerly Manned Spacecraft Center)
NPO	Jet Propulsion Laboratory/NASA Pasadena Office

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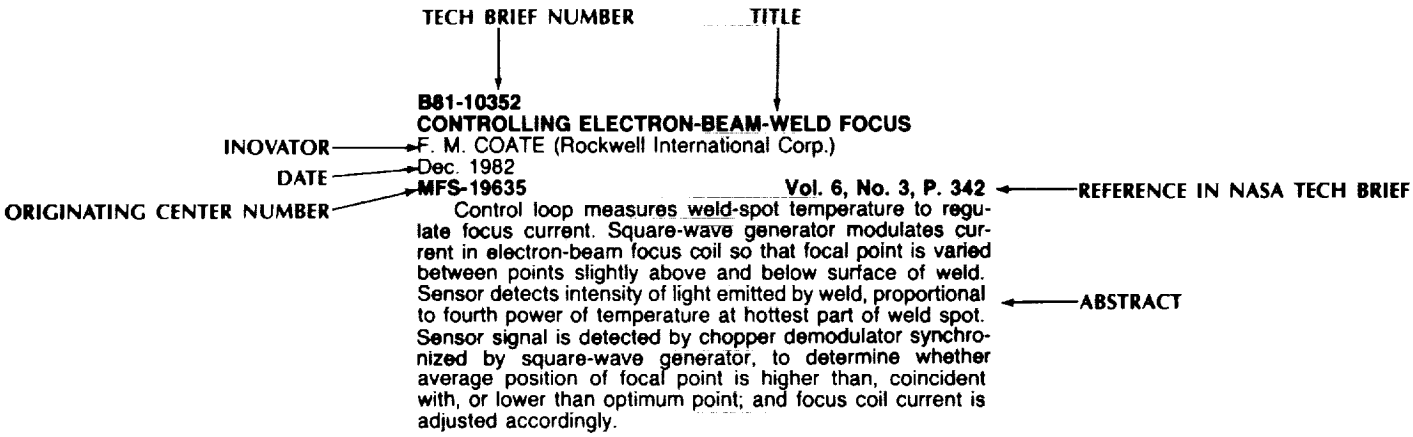


Index to 1981 NASA Tech Briefs

July 1986

Abstract Section

01 ELECTRONIC COMPONENTS AND CIRCUITS

B81-10001
THREE-PHASE POWER FACTOR CONTROLLER
F. J. NOLA
Sep. 1982
MFS-25535 **Vol. 6, No. 1, P. 3**

Three-Phase Power-Factor Controller develops a control signal for each motor winding. As motor loading decreases, rms value of applied voltage is decreased by feedback-control circuit. Power consumption is therefore lower than in unregulated operation. Controller employs phase detector for each of three phases of delta-connected induction motor. Phase-difference sum is basis for control.

B81-10002
LOAD-RESPONSIVE MOTOR CONTROLLER
T. M. EDGE
Sep. 1982
MFS-25560 **Vol. 6, No. 1, P. 4**

New circuit controls voltage applied to a three-phase induction motor in response to magnitude of current, so as to reduce power consumption when the motor is idling or operating at less than full load. Control circuit decreases rms applied voltage to match decreases in motor load over entire torque range. This considerably decreases power consumption in motors operating at a fraction of their rated torques.

B81-10003
POWER-FACTOR CONTROLLER WITH REGENERATIVE BRAKING
F. J. NOLA
Sep. 1982
MFS-25477 **Vol. 6, No. 1, P. 5**

Modified power-factor motor-control circuit operates motor as a phase-controlled generator when load attempts to turn at higher than synchronous speed. An induction motor is required to act at times as a brake. Circuit modification allows power-factor controller to save energy in motoring mode and convert automatically to an induction-generator controller in generating, or braking, mode.

B81-10004
COMPACT DUAL-MODE MICROWAVE ANTENNA
K. L. CARR (Microwave Associates, Inc.)
Sep. 1982
LAR-12784 **Vol. 6, No. 1, P. 6**

Compact dual-mode antenna, 3.66 cm wide by 1.83 cm thick is used both for heating and thermographic detection of tumors in cancer research. Temperature sensor operates independently or simultaneously with heater. Antenna includes 1.6-GHz transmitter and 4.76-GHz receiver. Strip heater between antennas controls temperature of device. Maximum power output is 25 W.

B81-10005
RESISTORS IMPROVE RAMP LINEARITY
L. L. KLEINBERG
Sep. 1982
GSC-12635 **Vol. 6, No. 1, P. 7**

Simple modification to bootstrap ramp generator gives more linear output over longer sweep times. New circuit adds just two resistors, one of which is adjustable. Modification cancels nonlinearities due to variations in load on charging capacitor and due to changes in charging current as the voltage across capacitor increases.

B81-10006
SPIKE-FREE AUTOMATIC LEVEL CONTROL
P. C. TOOLE and D. MCCARTHY (Planning Research Corp.)
Sep. 1982
KSC-11170 **Vol. 6, No. 1, P. 8**

New automatic-level-control circuit protects against signal 'overshoot.' Zener diodes and series capacitors prevent voltage spikes (caused by sudden increase in input level) from appearing at output. When spike voltage drops below breakdown voltage of Zener diodes, they turn off. Initial output level is determined by Zener breakdown voltage and capacitance of series capacitor.

B81-10007
IMPROVED MODEL FOR MOS BREAKDOWN
S. P. LI (CALTECH) and J. MASERJIAN (CALTECH)
Sep. 1982
NPO-14850 **Vol. 6, No. 1, P. 8**

With an improved model, accelerated high-field tests can be used to predict gate-oxide breakdown in metal-oxide-semi-conductor (MOS) structures. Principal mechanism in MOS breakdown is mobile-ion emission from metal/oxide interface, which occurs during application of positive gate-bias field. Breakdown is related to clustering of emitted ions at localized defect sites in oxide/silicon interface. Using new model to interpret data, tests that normally take several weeks at low fields to accumulate sufficient statistics can be completed in only a few hours at high fields.

B81-10008
ROTARY TRANSFORMER SEALS POWER IN
P. A. STUDER and J. PAULKOVICH
Sep. 1982
GSC-12595 **Vol. 6, No. 1, P. 9**

Rotary transformer originally developed for spacecraft transfers electrical power from stationary primary winding to rotating secondary without sliding contacts and very little leakage of electromagnetic radiation. Transformer has two

stationary primary windings connected in parallel. Secondary, mounted on a shaft that extends out of housing, rotates between two windings of primary. Shaft of secondary is composed of electrically conducting inner and outer parts separated by an insulator. Electrical contact is made from secondary winding, through shaft, to external leads.

B81-10009
MULTILAYER, FRONT-CONTACT GRID FOR SOLAR CELLS
A. G. MILNES (Carnegie Mellon Univ.) and A. FLAT (Carnegie Mellon Univ.)
Sep. 1982
LAR-12613 **Vol. 6, No. 1, P. 10**

Proposed multilayer, front-contact grid structure for solar cells optimizes collection of photogenerated current with minimum power losses. It is constructed of several layers of conducting grids. With multilayer concept, peak efficiency can occur at higher output-power levels. Because of this, higher solar concentrations can be applied to solar-cell arrays.

B81-10010
LOG-OUTPUT SIGNAL PROCESSOR SCANS EIGHT DECADES
J. L. HAYDEN (Martin Marietta Corp.)
Sep. 1982
ARC-11293 **Vol. 6, No. 1, P. 11**

Processor has automatic range switching and continuous readout over eight decades. Comparator output switches logarithmic converter to detector of interest and enables blinder grid to protect more-sensitive detector when operating in high-input range. Could be used to process any wide-varying signal that is to be read on a limited-range recording device such as a strip-chart recorder.

B81-10011
HIGH-FREQUENCY GATED OSCILLATOR
C. A. BERARD (RCA Corp.)
Sep. 1982
MSC-18634 **Vol 6, No. 1, p. 12**

New gated oscillator generates bursts of high-frequency sine waves, square waves, and triangular waves in response to control signals. Each burst starts at zero phase, with tight tolerances on signal amplitude and frequency. Frequencies in megahertz range are made possible by using high-speed comparators and high-speed flip-flop as fast-response threshold detector.

B81-10119
SOLAR-ARRAY SIMULATOR
M. C. WRIGHT (Lockheed Corp.)
Nov. 1982
MSC-18864 **Vol. 6, No. 2, P. 123**

A convenient solar-array simulator has been built for testing systems powered by solar cells. Built for evaluating power extension package in Space Shuttle, the circuit produces the V/I curves of photocell sources; even duplicating transient behavior under partial illumination associated with morning and evening penumbra.

B81-10120
HIGH-EFFICIENCY DC/DC CONVERTER
J. STURMAN
Nov. 1982
LEW-13486 **Vol. 6, No. 2, P. 124**

High-efficiency dc/dc converter has been developed that provides commonly used voltages of plus or minus 12 Volts from an unregulated dc source of from 14 to 40 Volts. Unique features of converter are its high efficiency at low power level and ability to provide output either larger or smaller than input voltage.

B81-10121
WIRE-WRAP CHATTER DETECTOR
G. Z. FISCH (CALTECH) and T. J. BORDEN (CALTECH)
Nov. 1982
NPO-15290 **Vol. 6, No. 2, P. 125**

Monitoring circuit responds to changes in resistance as little as 0.1 ohm. Has been used to detect defective wire-wrap connections during thermal and vibration tests. Defect is indicated to operator by light-emitting diode and by increase in count on a two-digit display.

B81-10122
ELECTRONICALLY CALIBRATABLE CLOCK
J. R. DAVIDSON and J. S. HEYMAN
Nov. 1982
LAR-12654 **Vol. 6, No. 2, P. 126**

Calibration circuit corrects apparent clock rate (ACR) of digital clock without altering oscillator frequency. Calibration circuit does not require iterative adjustments to reference frequency or rate, and correction to ACR is controlled by pushbuttons. Technique is applicable to any timer or counter that counts up to predetermined number then outputs a pulse to a readout register or to control another device.

B81-10123
LOAD PULSER IS SPARKLESS
F. D. WASHBURN (Boeing Services International, Inc.)
Nov. 1982
KSC-11199 **Vol. 6, No. 2, P. 127**

Electronic load pulser uses silicon-controlled rectifier (SCR) and timer to open and close circuit periodically. It replaces a motor-driven mechanical switch, which causes sparks and is unsafe in hazardous environments. Device should find applications in chemical petroleum, and transportation industries.

B81-10124
ALTERNATING-CURRENT MOTOR DRIVE FOR ELECTRIC VEHICLES
S. KRAUTHAMER (CALTECH) and W. E. RIPPEL (CALTECH)
Nov. 1982
NPO-14768 AND NPO-14830 **Vol. 6, No. 2, P. 128**

New electric drive controls speed of a polyphase as motor by varying frequency of inverter output. Closed-loop current-sensing circuit automatically adjusts frequency of voltage-controlled oscillator that controls inverter frequency, to limit starting and accelerating surges. Efficient inverter and ac motor would give electric vehicles extra miles per battery charge.

B81-10125
TWO-STAGE LINEARIZATION CIRCUIT
G. C. WALDECK (Sperry Flight Systems) and J. B. DENDY (Sperry Flight Systems)
Nov. 1982
LAR-12577 **Vol. 6, No. 2, P. 129**

High accuracy is obtained by combining analog and digital corrections. Proximity-sensor linearization circuit has two stages. First-stage linearization is accurate to about 3 percent; accuracy of final output is better than 0.5 percent. By modifying contents of the Programable Read-Only Memory (PROM), circuit can also be used to derive a nonlinear output.

B81-10126
LIGHTWEIGHT, LOW-LOSS DC TRANSDUCER
S. NAGANO (CALTECH), T. KOERNER (CALTECH), P. BRISENDINE (CALTECH), H. WEINER (CALTECH), and R. DETWILER (CALTECH)
Nov. 1982
NPO-14618 **Vol. 6, No. 2, P. 130**

Direct current is measured by lightweight, magnetically coupled transducer that weighs only 4 grams, without actually being wired into circuit under test. Miniature dc transducer has five windings: 2 for ac excitation inputs, 2 for dc control inputs, and 1 for feedback. Wire gages are selected for minimum size and weight. Size and number of

turns of dc windings are selected according to dc current range to be measured.

B81-10248
WIDEBAND AMPLIFIER WITH SUBPICOSECOND STABILITY
V. S. REINHARDT and W. A. ADAMS
Dec. 1982
GSC-12646 **Vol.6, No. 3, P. 247**

RF circuit offers high isolation as well as phase stability. For temperature stability, all circuit components are contained in closed metal housing; packages of active circuit elements are embedded in common heat sink. Provisions not only slow down effect of ambient temperature changes on individual devices but also reduce temperature differences across devices so that differential temperature effects vanish.

B81-10249
BOLTLESS SEAL FOR ELECTRONIC HOUSINGS
R. H. DAWE (CALTECH) and J. T. EVANS (CALTECH)
Dec. 1982
NPO-14818 **Vol. 6, No. 3, P. 248**

Spring clips seal housings for electronic circuitry, preventing electromagnetic interference from entering or leaving housings. Clips also keep dust out of housing. Since no bolts are used, housing can be opened quickly; unlike bolts, clips can be used on thin-walled housing. Seal was developed for an X-band array amplifier.

B81-10250
UNEQUAL-SPLIT STRIP-LINE POWER DIVIDER
M. C. BAILEY
Dec. 1982 NASA TM-81870(N80-31684/NSP)
LAR-12797 **Vol. 6, No. 3, P. 249**

Simple technique for designing strip-line or microstrip power dividers can be used for unequal, but inphase power split. Technique allows power splits ranging from equal to as large as required, with advantage of using same line impedances and line spacings for all splits. Output power ratio is determined by selecting location of input port in manner analogous to tap point for electric-power transformer.

B81-10251
HIGH-DENSITY TERMINAL BOX FOR TESTING WIRE HARNESS
W. B. PIERCE (CALTECH) and W. G. COLLINS (CALTECH)
Dec. 1982
NPO-15147 **Vol. 6, No. 3, P. 250**

Compact terminal box provides access to complex wiring harnesses for testing. Box accommodates more than twice as many wires as previous boxes. Box takes in wires via cable connectors and distributes them to contacts on box face. Instead of separate insulated jacks in metal face panel, box uses pairs of small military-standard metal sockets in precision-drilled plastic panel. Shorting plug provides continuity for wires when not being tested.

B81-10252
FAILURE DETECTOR FOR POWER-FACTOR CONTROLLER
F. J. NOLA
Dec. 1982
MFS-25607 **Vol. 6, No. 3, P. 251**

New protective circuits have been developed for power-factor ac motor controllers. Circuits prevent direct current and consequent motor heating that would normally result from failure of solid-state switch in controller. Single-phase power-factor controller with short detector compensates for short-circuit failure in either direction by applying full power to motor. Controller with open detector compensates for open-circuit failure in either direction by turning off power to motor.

B81-10253
PRECISE PHASE COMPARATOR FOR NEARLY EQUAL FREQUENCIES
V. S. REINHARDT and W. A. ADAMS
Dec. 1982
GSC-12645 **Vol. 6, No. 3, P. 252**

New circuit precisely compares phases of two RF signals nearly equal in frequency, such as two hydrogen-maser frequency standards. Measuring circuit minimizes interactions between two sources. Also stabilized against thermal effects and against noise that could produce erroneous readings. Heat sinking, buffer amplifiers, and low-noise zero-crossing detector make picosecond precision possible.

B81-10254
FLASHLAMP DRIVER FOR QUASI-CW LASER PUMPING
K. E. LOGAN (International Laser Systems, Inc.)
Dec. 1982
GSC-12566 **Vol. 6, No. 3, P. 253**

Circuit maintains constant high-current level through lamp while lighted and a low simmer current through lamp while not lighted. Lamp current is switched between these two modes by transistor; transistor is therefore called current-mode switch. Stable light pulses are emitted from flashlamp when monostable multivibrator goes high, in part because unsaturated transistor switch has negative feedback control that keeps lamp current constant.

B81-10255
LOW-NOISE BAND-PASS AMPLIFIER
L. KLEINBERG
Dec. 1982
GSC-12567 **Vol. 6, No. 3, P. 254**

Circuit uses standard components to overcome common limitation of JFET amplifiers. Low-noise band-pass amplifier employs JFET and operational amplifier. High gain and band-pass characteristics are achieved with suitable choice of resistances and capacitances. Circuit should find use as low-noise amplifier, for example as first stage instrumentation systems.

B81-10256
ARC-FREE HIGH-POWER DC SWITCH
W. N. MILLER (Rockwell International Corp.) and O. E. GRAY (Rockwell International Corp.)
Dec. 1982
MSC-20091 **Vol. 6, No. 3, P. 255**

Hybrid switch allows high-power direct current to be turned on and off without arcing or erosion. Switch consists of bank of transistors in parallel with mechanical contacts. Transistor bank makes and breaks switched circuit; contacts carry current only during steady-state 'on' condition. Designed for Space Shuttle orbiter, hybrid switch can be used also in high-power control circuits in aircraft, electric autos, industrial furnaces, and solar-cell arrays.

B81-10257
POWER-MOSFET VOLTAGE REGULATOR
W. N. MILLER (Rockwell International Corp.) and O. E. GRAY (Rockwell International Corp.)
Nov. 1982
MSC-20059 **Vol. 6, No. 3, P. 256**

Ninety-six parallel MOSFET devices with two-stage feedback circuit form a high-current dc voltage regulator that also acts as fully-on solid-state switch when fuel-cell out-put falls below regulated voltage. Ripple voltage is less than 20 mV, transient recovery time is less than 50 ms. Parallel MOSFET's act as high-current dc regulator and switch. Regulator can be used wherever large direct currents must be controlled. Can be applied to inverters, industrial furnaces photovoltaic solar generators, dc motors, and electric autos.

B81-10258
MODULAR AMPLIFIER/ANTENNA ARRAYS
E. F. BELOHOUBEK (RCA Corp.)

Dec. 1982
MSC-18981 **Vol. 6, No. 3, P. 257**

Two proposed solar-powered microwave transmitter modules would include amplifiers in direct contact with antenna dipoles so that metalization of dipoles serves as heat-dissipation areas for amplifiers. In integrated energy converter (solar radiation to microwaves), solar cells feed dc power directly to microwave amplifier/antenna modules. Antenna elements also serve as heat sinks for amplifiers.

02 ELECTRONIC SYSTEMS

B81-10012
OPTICAL MEMORY STORES 10 12SUP. BITS
Innovator Not Given(Harris Corp.) Sep. 1982
MFS-25456 **Vol. 6, No. 1, P. 15**

Optical Mass Memory has separate recorder (write) and reproducer (read) modules. Data are recorded on fiches and stored in a carrousel. Fische is retrieved from carrousel by transporter in under 10 seconds. Input to optical memory is standard TV camera. TV monitor at memory output displays stored video images when they are retrieved from fisches. Input to the optical memory can also be taken from pseudorandom sequence generator.

B81-10013
NEW ALGORITHMS MANAGE FOURFOLD REDUNDANCY
H. C. GELDERLOOS (Honeywell, Inc.)
Sep. 1982
MSC-18498 **Vol. 6, No. 1, P. 16**

Redundant sensors, actuators, and computers improve reliability of complex control systems, such as those in nuclear powerplants and aircraft. If one or more redundant elements fail, another takes over so that normal operation is not interrupted. Quad selection filter rejects data from null-failed and hardover-failed and hardover-failed units.

B81-10014
GRAPHICS-SYSTEM COLOR-CODE INTERFACE
J. S. TULPPO (Sperry Rand Corp.)
Sep. 1982
LAR-12646 **Vol. 6, No. 1, P. 17**

Circuit originally developed for a flight simulator interfaces a computer graphics system with color monitor. Subsystem is intended for particular display computer (AGT-130, ADAGE Graphics Terminal) and specific color monitor (beam penetration tube--Penetron). Store-and-transmit channel is one of five in graphics/color-monitor interface. Adding 5-bit color code to existing graphics programs requires minimal programing effort.

B81-10015
SOLAR-POWERED SUPPLY IS LIGHT AND RELIABLE
A. E. WILLIS, H. GARRETT, and J. MATHENEY
Sep. 1982
MFS-25430 **Vol. 6, No. 1, P. 18**

DC supply originally intended for use in solar-powered spacecraft propulsion is lightweight and very reliable. Operates from 100-200 volt output of solar panels to produce 11 different dc voltages, with total demand of 3,138 watts. With exception of specially wound inductors and transformers, system uses readily available components.

B81-10016
IMPROVED PHASE-LOCK DETECTOR
L. M. BRONSTEIN
Sep. 1982
MSC-18797 **Vol. 6, No. 1, P. 19**

Single detection channel is used alternately by in-phase (I) and quadrature (Q) signals, under control of a dither switch. By eliminating errors caused by unbalance of the I and Q channels, this dither-balanced detector reduces false locking. Can be used to improve detection probability and reduce false alarm probability for any loop that must acquire signal with low signal-to-noise ratio.

B81-10017
ADVANCED TECHNOLOGIES FOR COMMERCIAL AIRPLANES
Innovator Not Given(Lockheed Aircraft Co. Airsearch Manufacturing Co. Honeywell, Inc.) Sep. 1982 SEE ALSO NASA CR-163576(N80-32375/NSP)
MSC-18982 **Vol. 6, No. 1, P. 20**

263-page report addresses what advanced electrical and electronic spacecraft technologies can be applied in commercial airplanes. Report discusses a study in which technologies used in the Space Shuttle were evaluated for their potential in commercial transports. Describes new technologies, airplanes, tradeoffs and methods of evaluation. Concludes that major beneficiary would be an advanced wide-body transport (500 passenger).

B81-10018
SHORT-CIRCUITED POWER NETWORKS
T. S. OEPOMO (Rockwell International Corp.)
Sep. 1982
MSC-18977 **Vol. 6, No. 1, P. 20**

NASA computer program automatically analyzes power-system networks under faulted conditions. Program is general enough to calculate single-line to ground faults and three-phase-to-ground faults. Several novel programing techniques automate analysis while reducing computing time and storage requirements. Program is written in FORTRAN IV for batch execution.

B81-10127
IMPACT-ENERGIZED TRANSMITTER
P. H. J. BROUSSARD
Nov. 1982
MFS-25379 **Vol. 6, No. 2, P. 131**

Impact-induced strain in piezoelectric ceramic could power a short-range transmitter. Proposed impact-energized radio transmission would eliminate the need for external power sources for batteries, which are often short lived and impractical to replace under operating conditions. Piezoelectric ceramic attached to impact head supplies energy to drive resonant circuit and antenna. Receiver tuned to resonant frequency receives short pulse.

B81-10128
STUDY OF TWO DIGITAL CHARGE-COUPLED DEVICES
D. D. WILSON (Martin Marietta Corp.) and V. F. YOUNG (Martin Marietta Corp.)
Nov. 1982 See Also NASA CR-161630(N81-15193/NSP)
MFS-25606 **Vol. 6, No. 2, P. 131**

Recent report describes reliability study of two charge-coupled-device (CCD) shift registers. Major objective of study was to establish methodology for selecting, testing, screening, derating and applying CCD's. Includes a discussion of CCD structures and operating principles. Characteristics of SCCD and BCCD types are compared.

B81-10129
TESTING PATCHBOARD CONNECTIONS AUTOMATICALLY
J. W. BRUNSON (IN-TEL-12)
Nov. 1982
KSC-11065 **Vol. 6, No. 2, P. 135**

Computer controlled patchboard verifier sequentially scans each pin on patchboard and notes its connection, if any, to all of other pins. Connection pattern is automatically compared with one known to be correct. Entire

patchboard of 1,632 connections can be verified in about a minute.

B81-10130
ARRAY PROCESSOR HAS POWER AND FLEXIBILITY
G. H. BARNES (Burroughs Corp.), S. F. LUNDSTROM (Burroughs Corp.), and P. E. SHAFER (Burroughs Corp.)
Nov. 1982
ARC-11292 **Vol. 6, No. 2, P. 136**
Proposed processor architecture would have flexibility of a multi-processor and computational power of a lockstep array. Using an efficient interconnection network, it accommodates a large number of individual processors and memory modules. Array architecture would be suitable for very large scientific simulation problems and other applications.

B81-10131
AUTOMATICALLY RECONFIGURABLE COMPUTER
Innovator Not Given(Hughes Aircraft Co.) Nov. 1982
MFS-25455 **Vol. 6, No. 2, P. 137**
Modular system changes its architecture to maximize either reliability or capacity. Reconfigurable computer is assembled from four kinds of modules: organizer/scheduler, memory, input/output processor, and central processor. Reconfiguration is initiated by a signal from a control panel or by fault interrupt from one of the modules.

B81-10132
FAST HOLOGRAPHIC COMPARATOR
D. W. VAHEY (Batelle Columbus Laboratories)
Nov. 1982 See Also NASA CR-3151(N79-30010/NSP)
LAR-12509 **Vol. 6, No. 2, P. 138**
Comparator is integrated-optical system constructed on a LiNb03sub. waveguide chip. Only the laser, lens and detector are external to chip. Aluminized surface gratings serve as input coupler and beam splitter. Light beams striking edges are returned by ordinary total internal reflection. Three operating modes are possible: A 'screening' mode, an 'identification' mode and a novel 'self-subtraction' mode.

B81-10133
CONTROLLER REGULATES AUXILIARY SOURCE FOR SOLAR POWER
F. J. NOLA
Nov. 1982
MFS-25637 **Vol. 6, No. 2, P. 139**
Load driven by two motors continuously draws power from a varying source (solar cells) and steady auxiliary source (utility company). Power-factor controller apportions electrical load between two sources to maintain motor speed. This novel application of power-factor controller would regulate input of auxiliary energy to a solar-powered system in response to availability of Sunlight.

B81-10134
IMPROVED PARALLEL-ACCESS ALINEMENT NETWORK
G. H. BARNES (Burroughs Corp.)
Nov. 1982
ARC-11155 **Vol. 6, No. 2, P. 140**
Network channels elements of data array from memory ports to processor ports using a hardware-generated binary control work. Depending on control work selected, data may be shifted in increments or transposed in each of three levels to reach appropriate processing ports. A similar arrangement with reversed wiring is used to return data from processing ports to respective memory modules. Selection gate used in network incorporates two AND gates feeding an OR gate. In some logic families the OR gate may be fabricated as a 'wired OR'.

B81-10135
PARALLEL-ACCESS ALINEMENT NETWORK USING BARREL SWITCHES
G. H. BARNES (Burroughs Corp.)
Nov. 1982
ARC-11162 **Vol. 6, No. 2, P. 141**
Practical version of parallel-access alinement network utilizes two barrel switches for interfacing N parallel memory modules with N parallel processing elements. Switches are interconnected where 17 memory ports (MP's) are connected to 17 processor ports (PP's). Network uses two electronic barrel switches to direct data flow in parallel data-processing system. Each switch can shift a multibit parallel input a predetermined number of places to left or right, end off, or end around in one clock-pulse.

B81-10259
LINE REPLACEABLE UNIT ANALYSIS
T. OEPOMO (Rockwell International Corp.) and T. V. PROUTY (Rockwell International Corp.)
Dec. 1982
MSC-20183 **Vol. 6, No. 3, P. 257**
Shuttle LRU (Line Replaceable Unit) Analysis Program (SLAP) aids in evaluation of LRU interface voltages In Shuttle orbiter electrical system. Slap includes reduced model of Shuttle LRU circuit. Although primarily intended for analysis of Shuttle LRU's SLAP could be adapted for voltage analysis in other situations.

B81-10260
METHOD FOR CANCELING IONOSPHERIC DOPPLER EFFECT
R. F. C. VESSOT (Smithsonian Institution)
Dec. 1982
MFS-25599 **Vol. 6, No. 3, P. 261**
Unified transponder system with hydrogen-maser oscillators at both stations can compensate for both motional and ionospheric components of Doppler shift. Appropriate choices of frequency shift in output of mixer m3. System exploits proportionality between dispersive component of frequency shift and reciprocal of frequency to achieve cancellation of dispersive component at output.

B81-10261
PROGRAMABLE INTERFACE HANDLES MANY PERIPHERALS
M. JASINSKI (IBM Corp.)
Dec. 1982
KSC-11132 **Vol. 6, No. 3, P. 262**
Microprocessor-based interface simplifies interconnection of peripheral device with common memory of network of minicomputers. Interface consists of microprocessor, bidirectional port that connects to common memory, bidirectional port that connects to user-selected peripheral, and asynchronous serial communications port. Programable interface is based around 6800 microprocessor. It is assembled from 90 integrated circuits.

B81-10262
PROCESSING PCM DATA IN REAL TIME
T. L. WISSINK (IBM Corp.)
Dec. 1982
KSC-11131 **Vol. 6, No. 3, P. 263**
Novel hardware configuration makes it possible for Space Shuttle launch processing system to monitor pulse-code-modulated data in real time. Using two microprogramable 'option planes,' incoming PCM data are monitored for changes at rate of one frame of data (80 16-bit words) every 10 milliseconds. Real-time PCM processor utilizes CPU in mini-computer and CPU's in two option planes.

B81-10263
ONE WAY OF TESTING A DISTRIBUTED PROCESSOR
R. EDSTROM (IBM Corp.) and D. KLECKNER (IBM Corp.)
Dec. 1982
KSC-11123 **Vol. 6, No. 3, P. 263**
Launch processing for Space Shuttle is checked out, controlled, and monitored with new system. Entire system can be exercised by two computer programs--one in master console and other in each of operations consoles. Control program in each operations console detects change in status

and begins task initiation. All of front-end processors are exercised from consoles through common data buffer, and all data are logged to processed-data recorder for posttest analysis.

B81-10264
ANALYZING MULTIRATE-SAMPLED SYSTEMS
N. HENDRIX
Dec. 1982
MFS-25541 **Vol. 6, No. 3, P. 264**

New method available for monitoring stability of system on basis of data sampled at multiple rates--in particular, at two rates, one of which is twice frequency of other. Method is called Multirate Matrix Frequency Response (MMFR) analysis. MMFR was used in Space Shuttle to evaluate effect of decreasing sample rate of error loop in ascent-phase digital autopilot. Should also be useful to designers of other control systems and to structural, civil, and mechanical engineers for structure and vibration analysis.

03 PHYSICAL SCIENCES

B81-10019
BEAM SPLITTER INTENSITIES ARE PRESELECTED
W. CAMPBELL and R. B. OWEN
Sep. 1982
MFS-25312 **Vol. 6, No. 1, P. 23**

New beam splitter is a block of optically clear material with two parallel polish faces. Some of area of one surface is coated with totally reflecting layer, which may be metal or dielectric. On opposite surface, a metal coating of stepped thickness offers a different reflectivity at each step. Width and spacing of reflecting zones are chosen to accommodate angle of spacing of incidence of input beam and desired spacing of ouput beams.

B81-10020
SEQUENTIAL-IMPULSE GENERATOR USES FIBER-OPTICS
L. C. YANG (CALTECH)
Sep. 1982
NPO-14939 **Vol. 6, No. 1, P. 24**

Light pulse from a ruby or neodymium-glass laser enters miniature optics of repetitive-detonation apparatus. Traveling along a bundle of optical fibers, light strikes laser-sensitive microdetonator and charge explodes. Apparatus then advances next charge in train into position. Possible applications of sequential-impulse generator are in creating shock waves for aerodynamics research and in generating electrical power by magnetohydrodynamics.

B81-10021
NEW ENERGY-SAVING TECHNOLOGIES USE INDUCTION GENERATORS
F. NOLA
Sep. 1982
MFS-25513 **Vol. 6, No. 1, P. 25**

Two energy-saving technologies tested recently at Marshall Space Flight Center use an induction motor operated in reverse (as an induction generator). In the first, energy ordinarily dissipated during load testing of machinery is recovered and returned to powerline. In the second, efficiency of wind-driven induction generator is improved, and useful range of windspeed is broadened. Both technologies take advantage of ac voltage developed across terminals of an induction motor when rotated at higher than-synchronous speed in the direction it normally turns when power is applied.

B81-10022
TEMPERATURE CONTROLLER FOR A SOLAR FURNACE
R. R. HALE (CALTECH) and A. R. MCDOUGAL (CALTECH)
Sep. 1982
NPO-15388 **Vol. 6, No. 1, P. 26**

Relatively-simple movable sheild has been suggested for controlling temperature of solar furnace. Temperature modulator can be set to have collected solar energy fully 'on', fully 'off' or any intermediate level. Parabolic mirror concentrates Sunlight into receiver. Shade plate that blocks insolation at back of receiver produces shade zone in center of collector. No radiation is returned to receiver from shade zone; only rays falling on other areas of reflecting surface are directed back toward receiver.

B81-10023
BATTLE KEEPS SOLAR ENERGY IN RECEIVER
A. R. MCDOUGAL (CALTECH) and R. R. HALE (CALTECH)
Sep. 1982
NPO-15387 **Vol. 6, No. 1, P. 27**

Mirror structure in solar concentrator reduces heat loss by reflection and reradiation. Baffle reflects entering rays back and forth in solar-concentrator receiver until they reach heat exchanger. Similarly, infrared energy reradiated by heat exchanger is prevented from leaving receiver. Surfaces of baffle and inside wall of receiver are polished and highly reflective at solar and infrared wavelengths.

B81-10024
PYRAMIDAL-REFLECTOR SOLAR HEATER
Innovator Not Given(Wormser Scientific Corp.) Sep. 1982 See also DOE/NASA CR-161202(N80-33865/NSP)
MFS-25571 **Vol. 6, No. 1, P. 27**

Motor-driven reflector compensates for seasonal changes in Sun's altitude. System has flat-plate absorbers mounted on north side of attic interior. Skylight window on south-facing roof admits Sunlight into attic, lined with mirrors that reflect light to absorbers. Reflectors are inner surfaces of a pyramid lying on its side with window at its base and absorber plates in a cross-sectional plane near its apex.

B81-10025
SOLAR WATER HEATER INSTALLATION PACKAGE
Innovator Not Given(Elcam, Inc.) Sep. 1982 See Also DOE/NASA CR-161562(N80-33866/NSP)
MFS-25573 **Vol. 6, No. 1, P. 28**

A 48-page report describes water-heating system, installation (covering collector orientation, mounting, plumbing and wiring), operating instructions and maintenance procedures. Commercial solar-powered water heater system consists of a solar collector, solar-heated-water tank, electrically heated water tank and controls. Analysis of possible hazards from pressure, electricity, toxicity, flammability, gas, hot water and steam are also included.

B81-10026
MOTEL DHW RETROFIT--DALLAS, TEXAS
Innovator Not Given(Day's Inn of America, Inc.) Sep. 1982 See Also DOE/NASA CR-161569(N81-10524/NSP)
MFS-25580 **Vol. 6, No. 1, P. 28**

Solar-energy system designed to provide 65% of total domestic-hot-water (DHW) demands for 100-room motel in Dallas, Texas is subject of a report now available. System is retrofit, and storage-tank size was limited to 1,000 gallons (3,785 1) by size of room where it is located.

B81-10027
SOLAR HOT WATER FOR MOTOR INN--TEXAS CITY, TEXAS
Innovator Not given(LaQuinta Motor Inns, Inc.) Sep. 1982 See Also DOE/NASA CR-261605(N81-15460/NSP)
MFS-25614 **Vol. 6, No. 1, P. 29**

Final report describes solar domestic-hot-water heater installation at LaQuinta Motor Inn, Texas City, Texas which furnished 63% of total hot-water load of new 98-unit inn.

Report presents a description of system, drawings and photographs of collectors, operations and maintenance instructions, manufacturers' specifications for pumps, and an engineer's report on performance.

B81-10028
SOLAR-ENERGY SYSTEM FOR A COMMERCIAL BUILDING--TOPEKA, KANSAS
Innovator Not Given(Kaw Valley State Bank and Trust Co.) Sep. 1982 See Also DOE/NASA CR-161595(N81-14393/NSP)
MFS-25609 **Vol. 6, No. 1, P. 29**

Report describes a solar-energy system for space heating, cooling and domestic hot water at a 5,600 square-foot (520-square-meter) Topeka, Kansas, commercial building. System is expected to provide 74% of annual cooling load, 47% of heating load, and 95% of domestic hot-water load. System was included in building design to maximize energy conservation.

B81-10029
SOLAR-HEATED WATER AT A MOTEL--MOBILE, ALABAMA
Innovator Not Given(LaQuinta Motors Inns, Inc.) Sep. 1982 See also DOE/NASA CR-161587(N81-13461/NSP)
MFS-25603 **Vol. 6, No. 1, P. 29**

Solar-assisted hot-water system for a new 122-unit motor inn in Mobile, Alabama, generates more than half the energy needed for hot-water heating at motel each year. System consists of 93 flat-plate collectors, 2,500 gallon (9,500 1) insulated storage tank located outdoors, heat exchangers and controls. Electronic thermometers, measuring the temperatures at 22 locations monitor system performance.

B81-10030
SOLAR-HEATED PUBLIC LIBRARY--TROY, OHIO
Innovator Not Given(Troy-Miami County Public Library Sep. 1982 See Also DOE/NASA CR-161588(N81-12545/NSP)
MFS-25601 **Vol. 6, No. 1, P. 30**

Report on installation, operation and performance of a solar-heating system installed at the Troy-Miami County Public Library in Troy, Ohio. Solar retrofit system complements passive solar-energy system and interfaces with existing heat, ventilation and air-conditioning systems.

B81-10031
SOLAR-COOLED CLASSROOM BUILDING--COLUMBUS, OHIO
Innovator Not Given(Columbus Technical Inst.) Sep. 1982 See Also DOE/NASA CR-161589(N81-12544/NSP)
MFS-25597 **Vol. 6, No. 1, P. 30**

Advanced, evacuated tubular collectors supply energy for heating and cooling of a university building. Report includes site files, specification references, drawings, and installation, operation and maintenance instructions.

B81-10032
SOLAR-HEATED AND COOLED OFFICE BUILDING--COLUMBUS, OHIO
Innovator Not Given(Columbia Gas System Service Corp.) Sep. 1982 See Also DOE/NASA CR-161603(N81-14394/NSP)
MFS-25608 **Vol. 6, No. 1, P. 30**

Final report documents solar-energy system installed in office building to provide space heating, space cooling and domestic hot water. Collectors mounted on roof track Sun and concentrate rays on fluid-circulating tubes. Collected energy is distributed to hot-water-fired absorption chiller and space-heating and domestic-hot-water preheating systems.

B81-10033
SOLAR HOT WATER FOR AN INDUSTRIAL LAUNDRY--FRESNO, CALIFORNIA
Innovator Not Given(ARATEX Services, Inc.) Sep. 1982 See Also DOE/NASA CR-161537(N80-32851/NSP)
MFS-25550 **Vol. 6, No. 1, P. 31**

Final report describes an integrated wastewater-heat recovery system and solar preheating system to supply part of hot-water requirements of an industrial laundry. Large retrofit solar-water-heating system uses lightweight collectors.

B81-10034
SOLAR WATER-HEATER DESIGN PACKAGE
Innovator Not Given(Elcam, Inc.) Sep. 1982 See Also DOE/NASA CR-161558(N80-33867/NSP)
MFS-25574 **Vol. 6, No. 1, P. 31**

Information on a solar domestic-hot water heater is contained in 146 page design package. System consists of solar collector, storage tanks, automatic control circuitry and auxiliary heater. Data-acquisition equipment at sites monitors day-by-day performance. Includes performance specifications, schematics, solar-collector drawings and drawings of control parts.

B81-10035
ENERGY-SYSTEMS ECONOMIC ANALYSIS
J. DOANE (Solar Energy Research Institute), M. L. SLONSKI (CALTECH), and C. S. BORDEN (CALTECH)
Sep. 1982
NPO-15097 **Vol. 6, No. 1, P. 32**

Energy Systems Economic Analysis (ESEA) program is flexible analytical tool for rank ordering of alternative energy systems. Basic ESEA approach derives an estimate of those costs incurred as result of purchasing, installing and operating an energy system. These costs, suitably aggregated into yearly costs over lifetime of system, are divided by expected yearly energy output to determine busbar energy costs. ESEA, developed in 1979, is written in FORTRAN IV for batch execution.

B81-10136
COMPACT ION SOURCE FOR MASS SPECTROMETERS
V. G. ANICICH (CALTECH) and W. T. J. HUNTRESS (CALTECH)
Nov. 1982
NPO-14324 **Vol. 6, No. 2, P. 145**

Cyclotron-resonance device uses miniature components and permanent magnet for small size, low weight, and low cost. Gas molecules are ionized by electrons from hot filament. Magnetic field, acting with electrostatic drift field, causes ions to move in circles with a superimposed drift perpendicular to both fields, toward the exit. Compact source can be used for studying ion-molecule reactions by ion cyclotron-resonance methods in conventional mass spectrometer with either magnetic sector or quadrupole sector.

B81-10137
3-D MANIPULATOR FOR MASS SPECTROMETER
J. C. CIRNER, I. HARDING-BARLOW, and K. G. SNETSINGER
1982
ARC-11323 **Vol. 6, No. 2, P. 146**

Small mass-spectrometer specimens are positioned in three dimensions by manipulator that employs two bellows to provide vacuum seal and accommodate movement of specimen holder. Inner bellows and outer bellows accommodate vertical and horizontal motion, respectively. Y-axis movement is in and out of plane of page. Specimen-holder column is hollow so electrical wires can pass through it to specimen.

B81-10138
EFFICIENT ENERGY-STORAGE CONCEPT
L. W. J. BRANTLEY and C. RUPP
Nov. 1982
MFS-25331 **Vol. 6, No. 2, P. 147**

Space-platform energy-storage and attitude-stabilization system utilizes variable moment of inertia of two masses attached to ends of retractable cable. System would be

brought to its initial operating speed by gravity-gradient pumping. When fully developed, concept could be part of an orbiting solar-energy collection system. Energy would be temporarily stored in system then transmitted to Earth by microwaves or other method.

B81-10139
EMR GAGE WOULD MEASURE COAL THICKNESS ACCURATELY
J. D. KING (Southwest Research Institute) and W. L. ROLLWITZ (Southwest Research Institute)
Nov. 1982
MFS-25555 **Vol. 6, No. 2, P. 148**

Laboratory tests indicate electron magnetic resonance (EMR) would be effective in measuring thickness of coal overlying rock substrate. In prototype dual-frequency EMR system, Sample is irradiated by two radio frequencies. Signals are mixed, producing sum and difference output frequencies that are detected by receiver. Magnetic field is varied to scan resonant spot through sample. In system designed for field use, electromagnet is U-shaped, so that sample can be adjacent to, rather than inside the probe. Same coil is used for transmitting and receiving.

B81-10140
SENSORS FOR PRECISE TRACKING
T. F. ZEHNPFENNING (Visidyne)
Nov. 1982
MFS-25579 **Vol. 6, No. 2, P. 149**

Sun-sensor optical system uses four pairs of penta-prisms to simplify alinement and reduce mechanical-stability requirements. Cross-shaped windows in field stop enhance sensitivity of signal detectors to changes in angular position. Two virtual images viewed by telescopes mark position and orientation of occulter panel. Reflector vertex, point source and corresponding virtual image are all equally spaced along a straight line.

B81-10141
SOLAR CONCENTRATOR IS GAS-FILLED
R. R. HALE (CALTECH)
Nov. 1982
NPO-15416 **Vol. 6, No. 2, P. 150**

Proposed reflector for concentrating solar rays is made of two flexible polymer films with pressurized gas between them. First film is clear, serving as a protective cover and pressure envelope; second film is metalized to serve as concentrating mirror. Focal length of mirror is adjusted by changing gas pressure.

B81-10142
POWERPLANT THERMAL-POLLUTION MODELS
S. S. LEE (University of Miami) and S. SENGUPTA (University of Miami)
Nov. 1982
KSC-11210 **Vol. 6, No. 2, P. 150**

Three models predict nature of thermal plumes from powerplant discharge into water. Free-surface model accomodates major changes in ocean currents. Rigid-model accurately predicts changes in thermal plume caused by other inputs and outputs, such as pumped-water storage and hydroelectric-plant discharges. One-dimensional model predicts approximate stratification in lake with such inputs and outputs over a long period.

B81-10143
PROPOSED INTEGRATED RADIO-TELESCOPE NETWORK
M. H. COHEN (CALTECH), M. S. EWING (CALTECH), G. S. LEVY (CALTECH), R. K. MALLIS (CALTECH), A. C. S. READHEAD (CALTECH), J. R. SMITH (CALTECH), and D. C. BACKER (University of California, Berkeley)
Nov. 1982
NPO-15417 **Vol. 6, No. 2, P. 151**

Proposed network of radio telescopes, controlled by a central computer and managed by a single organization, offer potential for research on a scale that could not be matched by present privately and publicly-owned radio telescopes. With 10 antenna sites, network would establish base lines thousands of miles long. Antennas will be linked to computer center by telephone circuits.

B81-10144
COMBUSTION OF COAL/OIL/WATER SLURRIES
R. O. KUSHIDA (CALTECH)
Nov. 1982
NPO-15462 **Vol. 6, No. 2, P. 152**

Proposed test setup would measure combustion performance of new fuels by rapidly heating a droplet of coal/oil/water mixture and recording resulting explosion. Such mixtures are being considered as petroleum substitutes in oil-fired furnaces.

B81-10145
ENERGY-STORAGE MODULES FOR ACTIVE SOLAR HEATING AND COOLING
J. C. PARKER
Nov. 1982 See Also DOE/NASA TM-82415(N81-23604/NSP)
MFS-25681 **Vol. 6, No. 2, P. 153**

34 page report describes a melting salt hydrate that stores 12 times as much heat as rocks and other heavy materials. Energy is stored mostly as latent heat; that is, heat that can be stored and recovered without any significant change in temperature. Report also describes development, evaluation and testing of permanently sealed modules containing salt hydrate mixture.

B81-10146
SOLAR WATER-HEATER DESIGN AND INSTALLATION
P. HARLAMERT, J. KENNARD, and J. CIRIUNAS
Nov. 1982
LEW-13665 **Vol. 6, No. 2, P. 153**

Solar/Water heater system works as follows: Solar--heated air is pumped from collectors through rock bin from top to bottom. Air handler circulates heated air through an air-to-water heat exchanger, which transfers heat to incoming well water. In one application, it may reduce oil use by 40 percent.

B81-10147
HEAT-TRANSFER FLUIDS FOR SOLAR-ENERGY SYSTEMS
J. C. PARKER
Nov. 1982
MFS-25629 **Vol. 6, No. 2, P. 154**

43-page report investigates noncorrosive heat-transport fluids compatible with both metallic and nonmetallic solar collectors and plumbing systems. Report includes tables and figures of X-ray inspections for corrosion and schematics of solar-heat transport systems and heat rejection systems.

B81-10148
EFFECTS OF HIGH TEMPERATURE ON COLLECTOR COATINGS
J. R. LOWERY
Nov. 1982
MFS-25651 **Vol. 6, No. 2, P. 154**

Report reveals electroplated black chrome is good coating for concentrating collectors in which temperatures are in the 650 degrees-800 degrees F (340 degrees - 430 degrees C) range. Black chrome thermal emittance is low and solar-absorption properties are not seriously degraded at high temperatures. Black coatings are used to increase absorption of solar energy by base metal while decreasing emission of infrared energy. Coatings are intended to improve efficiency of solar collectors.

B81-10149
SOLAR HEATING AND COOLING FOR A CONTROLS MANUFACTURING PLANT LUMBERTON, NEW JERSEY
Innovator Not Given(RKL Controls Co.) Nov. 1982 See

Also DOE/NASA CR-161679(N81-23597/NSP)
MFS-25665 **Vol. 6, No. 2, P. 154**

Comprehensive report documents computer-controlled system which has separate solar-collector and cooling-tower areas located away from building and is completely computer controlled. System description, test data, major problems and resolution, performance, operation and maintenance, manufacturer's literature and drawing comprise part of 257-page report.

B81-10150
SOLAR SPACE AND WATER HEATING FOR HOSPITAL --CHARLOTTESVILLE, VIRGINIA
Innovator Not Given(David C. Wilson Neuropsychiatric Hospital) Nov. 1982 See Also DOE/NASA CR-161675 (N81-22471/NSP)
MFS-25666 **Vol. 6, No. 2, P. 155**

Solar heating system described in an 86-page report consists of 88 single-glazed selectively-coated baseplate collector modules, hot-water coils in air ducts, domestic-hot-water preheat tank, 3,000 Gallon (11,350-1) concrete urethane-insulated storage tank and other components.

B81-10151
SOLAR HOT WATER FOR A MOTOR INN -- LAS VEGAS, NEVADA
Innovator Not Given(LaQuinta Motor Inns) Nov. 1982 See Also DOE/NASA CR-161642(N81-21535/NSP)
MFS-25646 **Vol. 6, No. 2, P. 155**

Solar hot-water installation at motor inn in Las Vegas, Nevada is described in report containing descriptions of design, philosophy, operation of system and problems and solutions. Provides drawings of solar roof plan, operator's instructions, manufacturers' brochures and copy of acceptance report.

B81-10152
SOLAR HEATING FOR A BOTTLING PLANT -- JACKSON, TENNESSEE
Innovator Not Given(Energy Solutions, Inc.) Nov. 1982 See Also DOE/NASA CR-161586(N81-73511/NSP)
MFS-25595 **Vol. 6, No. 2, P. 156**

Report describes retrofit solar-heating system designed for and installed in bottle works in Tennessee. System consists of 9,480 square feet (880 Square meters) of evacuated-tube solar collectors with attached specular cylindrical reflectors. Tubular collectors are expected to supply 55 percent of total thermal load.

B81-10153
ECONOMIC EVALUATION OF OBSERVATORY SOLAR-ENERGY SYSTEM
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 See Also DOE/NASA CR-161724(N81-25510/NSP)
MFS-25682 **Vol. 6, No. 2, P. 156**

Long-term economic performance of a commercial solar-energy system was analyzed and used to predict economic performance at four additional sites. Analysis described in report was done to demonstrate viability of design over a broad range of environmental/economic conditions. Topics covered are system description, study approach, economic analysis and system optimization.

B81-10154
ECONOMIC EVALUATION OF SINGLE-FAMILY-RESIDENCE SOLAR-ENERGY INSTALLATION
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 See Also DOE/NASA CR-161723(N81-24532/NSP)
MFS-25683 **Vol. 6, No. 2, P. 156**

Long-term economic performance of a commercial solar-energy system was analyzed and used to predict economic performance at four additional sites. Analysis described in report was done to demonstrate viability of design over a broad range of environmental/economic conditions. Report contains graphs and tables that present evaluation procedure and results. Also contains appendixes that aid in understanding methods used.

B81-10155
ECONOMIC EVALUATION OF TOWNHOUSE SOLAR ENERGY SYSTEM
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 See Also DOE/NASA CR-161722(N81-23605/NSP)
MFS-25684 **Vo. 6, No. 2, P. 156**

Solar-energy site in Columbia, South Carolina, is comprised of four townhouse apartments. Report summarizes economic evaluation of solar--energy system and projected performance of similar systems in four other selected cities. System is designed to supply 65 percent of heating and 75 percent of hot water.

B81-10156
ECONOMIC EVALUATION OF OFFICE SOLAR-HEATING SYSTEM
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 See Also DOE/NASA CR-161725(N81-23607/NSP)
MFS-25685 **Vol. 6, No. 2. P. 157**

Solar-energy system at U.S. Department of Transportation Test Center at Pueblo, Colorado and five similar installations around the country is the subject of 109-page report. Objective of economic analysis is to report long-term economic performance of system at installation site and to extrapolate results to four other locations and an alternate site.

B81-10157
DORMITORY SOLAR-ENERGY-SYSTEM ECONOMICS
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 DOE/NASA CR-161726(N81-24531/NSP)
MFS-25693 **Vol. 6, No. 2, P. 158**

102-page report analyzes long-term economic performance of a prepackaged solar energy assembly system at a dormitory installation and extrapolates to four additional sites about the U.S. Method of evaluation is f-chart procedure for solar-heating and domestic hotwater systems.

B81-10158
TWO-STORY-DWELLING SOLAR INSTALLATION
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 See Also DOE/NASA CR-161727(N81-24585/NSP)
MFS-25697 **Vol. 6, No. 2, P. 158**

Report covers system description of a roof mounted solar energy system in Georgia. Includes study approach, economic analysis, results of analysis and economic uncertainty analysis. Elaboration on some of equations, procedures, and parameters used in analysis is found in report appendixes.

B81-10159
RANGER STATION SOLAR-ENERGY SYSTEM RECEIVES ECONOMIC EVALUATION
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 See Also DOE/NASA CR-161728(N81-24541/NSP)
MFS-25699 **Vol. 6, No. 2, P. 158**

Economic performance of Glendo Reservoir Ranger Station solar-energy system in Wyoming and extrapolated performance in four other locations around the U.S. Is reviewed in report. System is a passive drain-down system using water as heat-transfer medium for space and hot-water heating.

B81-10160
ECONOMIC EVALUATION OF DUAL-LEVEL-RESIDENCE SOLAR-ENERGY SYSTEM
Innovator Not Given(Federal Systems Division of IBM

Corp.) Nov. 1982 See Also DOE/NASA CR-161729(N81-25541/NSP)
MFS-25700 **Vol. 6, No. 2, P. 159**

105-page report is one in a series of economic evaluations of different solar-energy installations. Using study results, an optimal collector area is chosen that minimizes life-cycle costs. From this optimal size thermal and economic performance is evaluated.

B81-10161
ECONOMIC EVALUATION OF SINGLE-FAMILY-RESIDENCE SOLAR-ENERGY SYSTEM
Innovator Not Given(Federal Systems Division of IBM Corp.) Nov. 1982 See Also DOE/NASA CR-161730(N81-25542/NSP)
MFS-25701 **Vol. 6, No. 2, P. 159**

Report concludes that where solar-energy system investment costs are presently high, future promise of savings due to increased conventional energy costs is not optimistic. This is because cost of system tends to increase at a rate not significantly less than the cost of conventional energy.

B81-10265
ROTATING THE PLANE OF PARALLEL LIGHT BEAMS
K. L. ORLOFF and H. YANAGITA
Dec. 1982
ARC-11311 **Vol. 6, No. 3, P. 267**

Rhomboid prism laterally displaces beam of light. Pairs of rhomboid prisms can rotate plane of two parallel beams of light and change spacing of beams. If each element of pair is mounted on independent motor-driven disk, angle of rotation of plane of beams can be varied over wide range. Among other uses, prism configurations can rotate plane of parallel laser beams used in laser velocimeter.

B81-10266
SOLAR-DRIVEN LIQUID-METAL MHD GENERATOR
F. HOHL and J. H. LEE (Vanderbuilt University)
Dec. 1982 NASA TM-81965(N81-27926/NSP)
LAR-12495 **Vol. 6, No. 3, P. 268**

Liquid-metal magnetohydrodynamic (MHD) power generator with solar oven as its heat source has potential to produce electric power in space and on Earth at high efficiency. Generator focuses radiation from Sun to heat driving gas that pushes liquid metal past magnetic coil. Power is extracted directly from electric currents set up in conducting liquid. Using solar energy as fuel can save considerable costs and payload weight, compared to previous systems.

B81-10267
IMPROVED LIXISCOPE
L. I. YIN
Dec. 1982
GSC-12587 **Vol. 6, No. 3, P. 269**

Improved lixiscope utilizes fast-decay scintillators and multiple or curved microchannels to achieve high energy and spatial resolution as well as single-photon counting. New unit, with higher energy resolution, is intended for X-ray astronomy, although it could be applied terrestrially wherever a sensitive portable radiation spectrometer is required for 20-to-200-keV range.

B81-10268
TEST-BED AIRCRAFT SCANNER
D. J. JOBSON, S. J. KATZBERG, R. B. SPIERS, C. A. HARDESTY, E. E. BURCHER, and S. H. IRWIN
Dec. 1982
LAR-12796 **Vol. 6, No. 3, P. 270**

Test-bed aircraft multispectral scanner (TBAMS) is line-scanning multispectral imaging system with eight visible/near-infrared channels and one thermal-infrared channel. Key design features of TBAMS are its large size and modular subsystem mounted on horizontal baseplate. This unique layout allows easy access to and replacement of subsystems and their subcomponents. System designed around existing inexpensive parts, sacrifices compactness for ease of modification.

B81-10269
SOLAR SIMULATOR AT MARSHALL SPACE FLIGHT CENTER
Innovator Not Given(Wyle Laboratories) Dec. 1982 See Also DOE/NASA CR-161825(N81-30523/NSP)
MFS-25742 **Vol. 6, No. 3, P. 271**

Solar Simulator is subject of 73-page report. Simulator can establish a variety of conditions that can be set at constant levels over a broad range. Conditions include solar-radiation intensity, spectrum and collimation; solar attitude; and wind speed and direction. Report describes Sun simulator, solar-collector system simulator, overall simulation setup, and instrumentation.

B81-10270
EVALUATION OF A LINE-CONCENTRATING SOLAR COLLECTOR
Innovator Not Given(Wyle Laboratories) Dec. 1982 See Also NASA CR-161856(N82-10502/NSP)
MFS-25778 **Vol. 6, No. 3, P. 271**

45-page report contains results of performance evaluation of line-concentrating solar collector. Collector employs parabolic trough to direct Sunlight to line along its focal axis, along which lies a black-chrome plated receiver tube covered by a glass tube containing still air. Reflective trough has aluminum-mirror surface covered with metallized acrylic film. Array of four collectors, positioned end to end was used for evaluation. Array was driven by single drive mechanism which was controlled by electronic tracking device.

B81-10271
MANIFOLD INSULATION FOR SOLAR COLLECTORS
Innovator Not Given(Wyle Laboratories) Dec. 1982 See Also NASA CR-161852(N82-10501/NSP)
MFS-25779 **Vol. 6, No. 3, P. 271**

Results of computer analysis of effects of various manifold insulation detailed in 23-page report show that if fluid is distributed to and gathered from array of solar collectors by external rather than internal manifold, effectiveness of manifold insulation has major influence on efficiency. Report describes required input data and presents equations that govern computer model. Provides graphs comparing collector efficiencies for representative manifold sizes and insulations.

B81-10272
SOLAR HEATER IN A WEST VIRGINIA COLLEGE
Innovator Not Given(J. E. Sturm, Inc.) Dec. 1982 See Also DOE/NASA CR-161756(N81-25491/NSP)
MFS-25706 **Vol. 6, No. 3, P. 272**

Solar space-heating and hot water system installed at Alderson-Broaddus College, Philippi, West Virginia, is described in 87-page document. Report contains description of building and its solar-energy system; specifications for solar-energy system, including collectors, coolant, storage tanks, circulation equipment, piping, controls, and insulation; acceptance test data; and discussion of problems with installation, their solution, and recommendations for dealing with excess solar energy.

B81-10273
SOLAR HEATING SYSTEM AT A RACQUETBALL CLUB
Innovator Not Given(ARC Associates) Dec. 1982 See Also NASA CR-16179(N81-28518/NSP)
MFS-25720 **Vol. 6, No. 3, P. 272**

Detailed 93-page report describes Arlington, Virginia racquetball club which obtains heat and hot water for its support area from solar collectors. Report explains modes of operation of system and details of acceptance-test plan.

B81-10274
SOLAR HEATING IN AN ELEMENTARY SCHOOL
Innovator Not Given(Portsmouth Public Schools) Dec. 1982 See Also DOE/NASA CR-161830(N81-31625/NSP)
MFS-25747 **Vol. 6, No. 3, P. 272**

Solar-heating and hot-water system installed in elementary school in Virginia is described in 154 page report. Report contains discussion of design philosophy and acceptance-test report. Provides instructions for installation, maintenance, and operation. Also furnishes mechanical drawings and manufacturers' data on pumps, valves, controllers, and other components.

B81-10275
SOLAR-COOLED HOTEL IN THE VIRGIN ISLANDS
H. HARBER
Dec. 1982 See Also DOE/NASA TM-82442(N81-33611/NSP)
MFS-25776 **Vol. 6, No. 3, P. 273**

Performance of solar cooling system is described in 21-page report. System provides cooling for public areas including ball rooms, restaurant, lounge, lobby and shops. Chilled water from solar-cooling system is also used to cool hot water from hotel's desalinization plant.

B81-10276
HOT WATER FOR MOTOR INN--GARLAND, TEXAS
Innovator Not Given(Day's Inn of America, Inc.) Dec. 1982 See Also DOE/NASA CR-161802(N81-28515/NSP)
MFS-25726 **Vol. 6, No. 3, P. 273**

35-page report describes solar collector system and its operation and presents projected system performance. Details calibration and maintenance procedures and lists and describes equipment that makes up system. System provides hot water for laundry, for showers and sinks in inn rooms.

B81-10277
SOLAR SPACE HEATING FOR WAREHOUSE--KANSAS CITY, KANSAS
Innovator Not Given(Ducat Investments, Inc.) Dec. 1982
MFS-25712 **Vol. 6, No. 3, P. 273**

New report describes warehouse/office building in Kansas City, Kansas which uses solar heating for warehouse portion and conventional heating and cooling for office portion. Building is divided into 20 equal units, each with its own solar-heating system. Modular design enables multiple units to be combined to form offices or warehouses of various sizes as required by tenants.

B81-10278
THE ECONOMICS OF SOLAR HEATING
J. A. FORNEY
Dec. 1982
MFS-25391 **Vol. 6, No. 3, P. 274**

SHCOST program assesses economic feasibility of solar energy for single-family residences and light commercial applications. Program analyzes life-cycle costs as well as sensitivity studies to aid designer in selecting most economically attractive solar system for single-family residence or light commercial application. SHCOST includes fairly comprehensive list of cost elements from which user may select.

04 MATERIALS

B81-10036
PREPARATION OF PERFLUORINATED IMIDOYLAMIDOXIME POLYMERS
R. W. ROSSER, R. H. KRATZER (Ultrasystem, Inc.), K. J. L. PACIOREK (Ultrasystem, Inc.), and T. I. ITO (Ultrasystem, Inc.)
Sep. 1982
ARC-11267 **Vol. 6, No. 1, P. 35**

Perfluorinated imidoylamidoxime polymers with excellent resistance to heat, chemicals and solvents are prepared by condensing a perfluorinated nitrile with a perfluorinated amidoxime in vacuum or inert atmosphere from 20 degrees to 70 degrees C. When both reactants are difunctional, oligomeric or polymeric products are obtained. After cyclization of imidoylamidoxime groups to 1,2,4-oxadiazole linkages, process yields highly resistant elastomers. Competing side reactions are inhibited by low processing temperature.

B81-10038
SYNTHESIS OF FIRE-EXTINGUISHING DAWSONITES
R. L. ALTMAN
Sep. 1982
ARC-11326 **Vol. 6, No. 1, P. 36**

Simple nonaqueous process synthesizes sodium or potassium, dawsonites effective against hydrocarbon fuel fires. Fire-extinguishing alkali metal dawsonites are prepared using a finely-pulverized equimolar mixture of hydrogen carbonate, or carbonates and aluminum hydroxide heated for 1 to 6 hours under carbon dioxide pressure.

B81-10039
IMPROVED FIRE-RESISTANT RESINS FOR LAMINATES
G. M. FOHLEN, J. A. PARKER, and I. K. VARMA (National Research Council)
Sep. 1982
ARC-11321 **Vol. 6, No. 1, P. 37**

Fire-resistant resins for fabricating laminates with inorganic fibers, especially graphite fibers, are formed from bisimides containing main-chain phosphorus and olefinic end groups. Bisimides are thermally polymerized to form resins and laminates virtually imcombustible in pure oxygen at 300 degrees C. New resins are suitable for many applications requiring good adhesion and excellent resistance to heat, fire, solvents and chemicals.

B81-10040
ELASTOMER-TOUGHENED POLYIMIDE ADHESIVES
A. K. ST. CLAIR and T. L. ST. CLAIR
Sep. 1982
LAR-12775 **Vol. 6, No. 1, P. 38**

T-Peel strengths of adhesive/Titanium bonds are compared for LARC-13 with and without elastomer additives. Elastomer toughening (incorporation of small amounts of rubber into polymer matrix) has been one of the most successful methods for modifying polymer toughness. Addition polyimides are currently under consideration as high-temperature adhesives for bonding composite materials such as titanium.

B81-10041
VISCOELASTIC PROPERTIES OF POLYMER BLENDS
S. D. HONG (CALTECH), J. MOACANIN (CALTECH), and D. SOONG (CALTECH)
Sep. 1982
NPO-14924 **Vol. 6, No. 1, P. 39**

Viscosity, shear modulus and other viscoelastic properties of multicomponent polymer blends are predicted from behavior of individual components, using a mathematical model. Model is extension of two-component-blend model based on Rouse-Bueche-Zimm theory of polymer viscoelasticity. Extension assumes that probabilities of forming various possible intracomponent and intercomponent entanglements among polymer molecules are proportional to relative abundances of components.

B81-10042
TWO-STAGE COMBUSTOR REDUCES POLLUTANT EMISSIONS

R. M. CLAYTON (CALTECH)
Sep. 1982
NPO-14911 **Vol. 6, No. 1, P. 40**

By controlling fuel-to-air ratio of local reactants, pollutant emissions would be minimized in a proposed two-stage combustor for gas-turbine engines. It would use fuel-rich partial-oxidation stage and air-rich combustion stage to reduce emissions of nitrogen oxide, carbon monoxide and hydrocarbons. Combustor fuel-lean burning limit would be extended simultaneously.

B81-10043
DEFORMATION-INDUCED ANISOTROPY OF POLYMERS
S. T. J. PENG (CALTECH) and R. F. LANDEL (CALTECH)
Sep. 1982
NPO-15325 **Vol. 6, No. 1, P. 41**

New theory calculates anisotropies induced by large deformations in polymers. Theory was developed primarily for calculating anisotropy of thermal expansivity, but is also applicable to thermal conductivity, elastic moduli and other properties. Theory assumes that in isotropic state, long polymer chains are randomly coiled and not oriented in particular direction. They acquire an orientation when material is deformed. As average molecular orientation increases with deformation, properties of bulk material exhibit averaging of the microscopic anistropies of the oriented molecular segments.

B81-10044
PLASMA DEPOSITION OF AMORPHOUS SILICON
H. F. CALCOTE (Aerochem Research Laboratories, Inc.)
Sep. 1982
NPO-14954 **Vol. 6, No. 1, P. 42**

Strongly adhering films of silicon are deposited directly on such materials as Pyrex and Vycor (or equivalent materials) and aluminum by a non-equilibrium plasma jet. Amorphous silicon films are formed by decomposition of silicon tetrachloride or trichlorosilane in the plasma. Plasma-jet technique can also be used to deposit an adherent silicon film on aluminum from silane and to dope such films with phosphorus. Ability to deposit silicon films on such readily available, inexpensive substrates could eventually lead to lower cost photovoltaic cells.

B81-10162
SYSTEM CONTROLS AND MEASURES OXYGEN FUGACITY
R. J. WILLIAMS
Nov. 1982 See Also NASA TM-58234(N81-17188/NSP)
MSC-20096 **Vol. 6, No. 2, P. 163**

System developed at Johnson Space Center controls and measures oxygen fugacity in high-temperature chemical research. A ceramic-electrolyte cell is the sensing element. All hardware needed to control gas flow and temperature and to measure cell electromotive force is included. An analytic balance allows in situ thermogravimetric sample analysis.

B81-10163
SURFACE SEAL FOR CARBON PARTS
D. M. SHUFORD (Vought Corp.) and J. P. SPRUIELL (Vought Corp.)
Nov. 1982
MSC-18898 **Vol. 6, No. 2, P. 164**

Surface pores in parts made of graphite or reinforced-carbon/ carbon materials are sealed by a silicon carbide-based coating. Coating inhibits subsurface oxidation and lengthens part life. Starting material for coating is graphite felt, which is converted to silicon carbide felt by processing it according to a prescribed time/temperature schedule. Converted felt is pulverized in a ball mill and resulting powder is mixed with an equal weight of black silicon carbide powder. Powder mixture is combined with an equal weight of adhesive to form a paste.

B81-10164
IMPROVED CURE-IN-PLACE SILICONE ADHESIVES
C. E. BLEVINS (McDonnell Douglas Corp.), J. SWEET (McDonnell Douglas Corp.), and R. GONZALEZ (McDonnell Douglas Corp.)
Nov. 1982
MSC-18782 **Vol. 6, No. 2, P. 164**

Two improved cure-in-place silicone-elastomer-based adhesives have low thermal expansion and low thermal conductivity. Adhesives are flexible at low temperature and withstand high temperatures without disintegrating. New ablative compounds were initially developed for in-flight repair of insulating tile on Space Shuttle orbiter. Could find use in other applications requiring high-performance adhesives, such as sealants for solar collectors.

B81-10165
MEASURING INTERDIFFUSION IN BINARY LIQUIDS
S. H. GELLES (Battelle Columbus Laboratories) and A. J. MARKWORTH (Battelle Columbus Laboratories)
Nov. 1982
MFS-25576 **Vol. 6, No. 2, P. 165**

Liquid-phase binary interdiffusion sample is prepared by enclosing wires of two metals in a capillary tube with ends touching. While sample is at elevated temperature, tube is kept oriented with lighter metal at top to prevent convection. New method is potential research tool in such areas as zone refining of metals, recycling of spent fuel rods, and improving removal of slag and inclusions from steel castings.

B81-10166
SUPERCRITICAL-FLUID EXTRACTION OF OIL FROM TAR SANDS
L. E. COMPTON (CALTECH)
Nov. 1982
NPO-15476 **Vol. 6, No. 2, P. 166**

New supercritical solvent mixtures have been laboratory-tested for extraction of oil from tar sands. Mixture is circulated through sand at high pressure and at a temperature above critical point, dissolving organic matter into the compressed gas. Extract is recovered from sand residues. Low-temperature super-critical solvents reduce energy consumption and waste-disposal problems.

B81-10167
PROLONGING THE LIFE OF REFRACTORY FILLERS
C. SCHOMBURG and R. L. DOTTS
Nov. 1982
MSC-18832 **Vol. 6, No. 2, P. 166**

Useful life of refractory glass-cloth gap filler is increased by coating it with a suspension of silicon carbide in butanol and polyethylene. Coating is applied to refractory-fiber cloth filler that seals gaps between insulating tiles on Space Shuttle orbiter. Tests showed that cloth fibers would be embrittled by extreme temperatures encountered on reentry into Earth's atmosphere and that only 25 percent of the thousands of fillers would be reusable after a mission. With coating, 85 percent of fillers would be reusable.

B81-10168
FLAME-RETARDANT COATING IS HEAT-SEALED
R. P. TSCHIRCH (Arthur D. Little, Inc.) and K. R. SIDMAN (Arthur D. Little, Inc.)
Nov. 1982
MSC-18382 **Vol. 6, No. 2, P. 167**

Plastic coating that makes fabrics flame-and abrasion-resistant is sealed to fabric by heat. Coating produces flexible, lightweight, impermeable fabrics that are firesafe and can withstand rough use. Coated fabric was developed for use in garments and containers for space exploration, but would also be suitable for rainwear, clothing for hazardous environments, and leakproof containers.

B81-10169
SUPERABSORBENT MULTILAYER FABRIC

J. V. COREALE and F. S. DAWN
Nov. 1982
MSC-18223 **Vol. 6, No. 2, P. 168**

B81-10170
FACTORS AFFECTING LIQUID-METAL EMBRITTLEMENT IN C-103
R. MCLEMORE (The Marquardt Co.) and F. K. LAMPSON (The Marquardt Co.)
Nov. 1982
MSC-18865 **Vol. 6, No. 2, P. 168**
Results of a study of weld cracks on Space Shuttle control thrustors point toward better understanding of cracking problem in columbium metal, which has also plagued nonaerospace users. Although liquid-metal embrittlement is known to be cause of problem, factors affecting growth and severity of cracks are not well understood. New results tie crack growth to type of contaminants present, grain size and level of stress present while welding is done.

B81-10171
ULTRAVIOLET-INDUCED MIRROR DEGRADATION
F. L. BOUQUET (CALTECH), T. T. HASEGAWA (CALTECH), and E. L. CLELAND (CALTECH)
Nov. 1982
NPO-15520 **Vol. 6, No. 2, P. 169**
Recent tests of second-surface mirrors show that ultraviolet radiation penetrates glass and metalized zone and impinges upon backing paint. According to report, many backing materials are degraded by ultraviolet radiation. Mirror corrosion is a serious problem in solar-energy collection systems. Effects of UV on polymeric materials have been studied, and in general, all are degraded by UV. Polymers most resistant to UV radiation are polyimides.

B81-10172
LOW-GRAVITY INVESTIGATIONS IN CAST-IRON PROCESSING
W. L. FRANKHOUSER (System Planning Corp.)
Nov. 1982
MFS-25491 **Vol. 6, No. 2, P. 169**
Report on the state of the art in cast-iron processing identifies possible improvements that might result from processing in absence of gravity. Report suggests areas in which the knowledge of gravitational effects could eventually lead to practical improvements in material performance.

B81-10173
'SIAION' MATERIALS FOR ADVANCED STRUCTURAL APPLICATIONS
S. DUTTA
Nov. 1982 See Also NASA TM-79207(N79-30378/NSP)
LEW-13671 **Vol. 6, No. 2, P. 170**
New ceramics for gas turbines and other applications are strong, oxidation resistant, and chemically stable. Recently prepared state-of-the-art report on SiAlON materials includes work on phase relations, crystal structure, synthesis, fabrication, micro-structure, and properties of various SiAlON's.

B81-10279
SILICONE/ACRYLATE COPOLYMERS
W. E. DENNIS (Dow Corning Corp.)
Dec. 1982
NPO-15523 **Vol. 6, No. 3, P. 277**
Two-step process forms silicone/acrylate copolymers. Resulting acrylate functional fluid is reacted with other ingredients to produce copolymer. Films of polymer were formed by simply pouring or spraying mixture and allowing solvent to evaporate. Films showed good weatherability. Durable, clear polymer films protect photovoltaic cells.

B81-10280
COAL AS A SUBSTITUTE FOR CARBON BLACK
R. O. KUSHIDA (CALTECH)
Dec. 1982
NPO-15461 **Vol. 6, No. 3, P. 277**
New proposal shows sprayed coal powder formed by extrusion of coal heated to plastic state may be inexpensive substitute for carbon black. Carbon black is used extensively in rubber industry as reinforcing agent in such articles as tires and hoses. It is made from natural gas and petroleum, both of which are in short supply.

B81-10281
SOUND-BURST GENERATOR FOR MEASURING COAL PROPERTIES
W. J. J. HADDEN (Georgia Institute of Technology), J. M. MILLS (Georgia Institute of Technology), and A. D. PIERCE (Georgia Institute of Technology)
Dec. 1982
MFS-25438 **Vol. 6, No. 3, P. 278**
Acoustical properties of coal can be measured accurately and with relative ease with aid of digital two-channel sine-wave sound generator. Generator is expected to provide information for development of acoustic devices for measuring thickness of coal in longwall mining. In echo-cancellation measurements, sound bursts are sent to coal sample from opposite directions. Transmitted and reflected amplitudes and phases are measured by transducers to determine coal properties.

B81-10282
CATALYZING THE COMBUSTION OF COAL
M. F. HUMPHREY (CALTECH) and W. DOKKO (CALTECH)
Dec. 1982
NPO-15456 **Vol. 6, No. 3, P. 279**
Reaction rate of coal in air can be increased by contacting or coating coal with compound such as calcium acetate. The enhanced reaction rate generates more heat, reducing furnace size. Increase in combustion rate is about 26 percent, and internal pollutants in powerplant are reduced.

B81-10283
LOW-GOLD-CONTENT BRAZING ALLOYS
A. BRENNAN (Rockwell International Corp.) and R. D. MCKOWN (Rockwell International Corp.)
Dec. 1982
MFS-19629 **Vol. 6, No. 3, P. 280**
Two new alloys for brazing at 1,760 degrees to 1,850 degrees F are stronger and have better gap-filling capability. Alloys have lower gold content than other gold brazes for their temperature range and therefore are far less expensive. They are produced in wire, foil, and powder and are excellent for brazing at temperatures where no suitable alloys existed--especially for step brazing copper.

B81-10284
ELECTROCHEMICAL ASSAY OF GOLD-PLATING SOLUTIONS
R. CHIODO (Rockwell International Corp.)
Dec. 1982
MFS-19639 **Vol. 6, No. 3, P. 280**
Gold content of plating solution is assayed by simple method that required only ordinary electrochemical laboratory equipment and materials. Technique involves electrodeposition of gold from solution onto electrode, the weight gain of which is measured. Suitable fast assay methods are economically and practically necessary in electronics and decorative-plating industries. If gold content in plating bath is too low, poor plating may result, with consequent economic loss to user.

B81-10285
XPS STUDY OF SIO2 AND THE SI/SIO2 INTERFACE
F. J. GRUNTHANER (CALTECH), P. J. GRUNTHANER (CALTECH), R. P. VASQUEZ (CALTECH), B. F. LEWIS (CALTECH), J. MASERJIAN (CALTECH), and A. MADHUKAR (CALTECH)
Dec. 1982

NPO-14968 **Vol. 6, No. 3, P. 281**

X-ray photoelectron spectroscopy (XPS) is analytical technique for understanding electronic structure of atoms close to surface in solids, in preference to bulk structure of material. Study found evidence for core-level chemical shifts arising from changes in local structural environment in amorphous SiO2 and at Si/SiO2 interface. Observed XPS spectra may be understood as sequential convolution of several functions, each with well-defined physical interpretation.

B81-10286
BLOWING AGENTS FOR FABRICATION OF POLYIMIDE FOAMS
J. GAGLIANI (International Harvester Co.), U. A. K. SORATHIA (International Harvester Co.), and R. LEE (International Harvester Co.)
Dec. 1982
MSC-18993 **Vol. 6, No. 3, P. 282**

Polyimide resin can be foamed by agent generated within matrix of powder precursor. Blowing agent is mixture of water and methanol that are byproducts of condensation/polymerization reaction in resin. Expansion of these two compounds produces cellular foam structure that is flexible and resilient but that tends to have very-fine cellular structure. More open structure with lower density can be attained by modifying mechanism of foam formation. Foams have applications as fillers for seat cushions, wall panels, floor sheets, and thermal and acoustical insulation.

B81-10287
VAPOR DETECTOR
H. M. WADDELL (Rockwell International Corp.), G. C. GARRARD (Rockwell International Corp.), and D. W. HOUSTON (Rockwell International Corp.)
Dec. 1982
MSC-18989 **Vol. 6, No. 3, P. 282**

Detector eliminates need for removing covers to take samples. Detector is canister consisting of screw-in base and clear plastic tube that contains two colors of silica gel. Monoethylhydrazine and nitrogen tetroxide vapors are visually monitored with canister containing color-changing gels.

B81-10288
REGENERATING WATER-STERILIZING RESINS
G. V. COLOMBO (Umpqua Research Co.) and D. F. PUTNAM (Umpqua Research Co.)
Dec. 1982
MSC-20001 **Vol. 6, No. 3, P. 283**

Iodine-dispensing resin can be regenerated after iodine content has been depleted, without being removed from water system. Resin is used to make water potable by killing bacteria, fungi, and viruses. Regeneration technique may be come basis of water purifier for very long space missions. Enough crystalline iodine for multiple regenerations during mission can be stored in one small cartridge. Cartridge could be inserted in waterline as necessary on signal from iodine monitor or timer.

B81-10289
WIDE-TEMPERATURE-RANGE TORQUE-STRIPE PAINT
E. R. MILLS (Rockwell International Corp.)
Dec. 1982
MFS-19644 **Vol. 6, No. 3, P. 284**

'Torque-stripe' paint withstands wide range of temperatures. The bright yellow paint, brushed on electrical connector, serves as both locking agent and indicator of loosened connection: Crack in paint stripe is readily visible and shows that bolts that are exposed to extremes of heat and cold.

B81-10290
NEUTRALIZING AMINE-CURED EPOXY SURFACES
S. Y. LEE
Dec. 1982
GSC-12686 **Vol. 6, No. 3, P. 284**

New surface treatment is a rapid, convenient, and effective method for converting unused amines and amine functional groups into neutral, noncorrosive substituted urea. Reaction proceeds at room temperature, takes only a few minutes, and leaves no corrosive residue. Surface should first be washed with alcohol to remove as much as possible of unreacted amine. Then it should be dried, since residual moisture or alcohol may consume some of treatment reagent and neutralization may then be incomplete.

B81-10291
HEAT-EXCHANGE FLUIDS FOR SULFURIC ACID VAPORIZERS
D. D. LAWSON (CALTECH) and G. R. PETERSEN (CALTECH)
Dec. 1982
NPO-15015 **Vol. 6, No. 3, P. 285**

Some fluorine-substituted organic materials meet criteria for heat-exchange fluids in contact with sulfuric acid. Most promising of these are perfluoropropylene oxide polymers with degree of polymerization (DP) between 10 and 50. It is desirable to have DP in high range because vapor pressure of material decreases as DP increases, and high-DP liquids have lower loss due to vaporization.

B81-10292
GAS DIFFUSION IN FLUIDS CONTAINING BUBBLES
M. ZAK (CALTECH) and M. C. WEINBERG (CALTECH)
Dec. 1982
NPO-15060 **Vol. 6, No. 3, P. 286**

Mathematical model describes movement of gases in fluid containing many bubbles. Model makes it possible to predict growth and shrink age of bubbles as function of time. New model overcomes complexities involved in analysis of varying conditions by making two simplifying assumptions. It treats bubbles as point sources, and it employs approximate expression for gas concentration gradient at liquid/bubble interface. In particular, it is expected to help in developing processes for production of high-quality opticai glasses in space.

B81-10293
GRAPHITE-FIBER-REINFORCED GLASS-MATRIX COMPOSITE
K. M. PREWO (United Technologies Corp.) and D. L. DICUS
Dec. 1982 See Also NASA CR-165711(N81-24181/NSP) and NASA CR-159312(N80-32440/NSP)
LAR-12764 **Vol. 6, No. 3, P. 286**

G/GI structural composite material made of graphite fibers embedded in borosilicate glass exhibit excellent strength, fracture toughness, and dimensional stability at elevated temperatures. It is made by passing graphite-fiber yarn through slurry containing suspension of fine glass particles in carrier liquid and winding on drum to produce prepegged uniaxial tape. After drying, tapes are cut into appropriate lengths and laid up in graphite die in desired stacking scheme. Stack is consolidated by hot pressing in furnace.

B81-10294
BINDERS FOR THERMAL-CONTROL COATINGS
W. J. PATTERSON and J. E. CURRY
Dec. 1982
MFS-25620 **Vol. 6, No. 3, P. 287**

Methyl trialkoxysilane hydrolysates have been found to be superior binders for radiative thermal-control coatings. Using sprayed test panels, candidate coating formulations were optimized with respect to binder/ pigment radio, ethanol content, pigment particle size, coating thickness, and curing conditions. Binders are made from monomers of trialkoxy-silanes or chain-extended alkoxysilanes. Monomers are believed to polymerize to ladder-type structures like methyl silicone.

B81-10295
THERMAL POLYMERIZATION OF N-BUTYL ACRYLATE

J. D. INGHAM (CALTECH)
Dec. 1982
NPO-15010 **Vol. 6, No. 3, P. 288**

Simple new polymerization method enables production of n-butyl acrylate polymer of desired high molecular weight, without disadvantages that usually attend more conventional methods. Process, which is hybrid of thermal, solution, and emulsion polymerization methods, involves controlled thermal polymerization of monomer at moderate temperatures without use of catalysts or additives.

05 LIFE SCIENCES

B81-10045
ALGORITHMS COULD AUTOMATE CANCER DIAGNOSIS
A. A. BAKY (Northrop Services, Inc.) and D. G. WINKLER (Northrop Services, Inc.)
Sep. 1982
MSC-18764 **vol. 6, No. 1, p. 45**

Five new algorithms are a complete statistical procedure for quantifying cell abnormalities from digitized images. Procedure could be basis for automated detection and diagnosis of cancer. Objective of procedure is to assign each cell an atypia status index (ASI), which quantifies level of abnormality. It is possible that ASI values will be accurate and economical enough to allow diagnoses to be made quickly and accurately by computer processing of laboratory specimens extracted from patients.

B81-10046
CONSTRAINT-FREE MEASUREMENT OF METABOLIC RATE
K. L. KOESTER (Technology, Inc.)
Sep. 1982 See Also NASA CR-160893(N81-14614/NSP)
MSC-18885 **Vol. 6, No. 1, P. 46**

By using hardware and software originally developed for manned spacecraft, metabolism is now measured while subject wears a loose-fitting mask. This more comfortable, less-restrictive measurement technique uses speed, accuracy and control capabilities of a microcomputer. Because mask imposes minimum interference to subject undergoing testing, it can be used to measure respiratory responses to such activities as treadmill exercise. Mask can be worn for long periods with little discomfort.

B81-10047
PORTABLE RADIOMETER MONITORS PLANT GROWTH
C. J. TUCKER, III and L. D. MILLER
Sep. 1982 See also NASA TM-80641(N80-27674/NSP)
GSC-12412 **Vol. 6, No. 1, P. 47**

Three-band hand-held spectral radiometer measures electromagnetic energy reflected from plant canopies in the visible and infrared portions of the spectrum. It is mobile and easy to use for rapid, repeated measurements. Radiometer probe is held level over plant canopy, readout range switches are set and measurements are recorded. Chlorophyll content, leaf area index and leaf water content can be quickly and easily measured.

B81-10048
CHEMICAL GROWTH REGULATORS FOR GUAYULE PLANTS
M. N. DASTOOR (CALTECH), W. W. SCHUBERT (CALTECH), and G. R. PETERSEN (CALTECH)
Sep. 1982
NPO-15213 **Vol. 6, No. 1, P. 48**

Test Tubes containing Guayule - tissue cultures were used in experiments to test effects of chemical-growth regulators. The shoots grew in response to addition of 2-(3,4-dichlorophenoxy)-triethylamine (triethylamine (TEA) derivative) to agar medium. Preliminary results indicate that a class of compounds that promotes growth in soil may also promote growth in a culture medium. Further experiments are needed to define the effect of the TEA derivative.

B81-10174
IMPROVED ELECTROPHORESIS CELL
P. H. RHODES and R. S. SNYDER
Nov. 1982
MFS-25426 **Vol. 6, No. 2, P. 173**

Several proposed modifications are expected to improve performance of a continous-flow electrophoresis cell. Changes would allow better control of buffer flow and would increase resolution by suppressing thermal gradients. Improved electrophoresis device would have high resolution and be easy to operate. Improvements would allow better flow control and heat dissipation.

B81-10175
SPEEDY ACQUISITION OF SURFACE-CONTAMINATION SAMPLES
J. R. PULEO (CALTECH) and L. E. KIRSCHNER (CALTECH)
Nov. 1982
NPO-14934 **Vol. 6, No. 2, P. 174**

Biological contamination of large-area surfaces can be determined quickly, inexpensively, and accurately with the aid of a polyester bonded cloth. Cloth is highly effective in removing microbes from a surface and releasing them for biological assay. In releasing contaminants, polyester bonded cloth was found to be superior to other commercial cleanroom cloths, including spun-bound polyamid cloths and cellulose cloths.

B81-10176
RETRACTOR TOOL FOR BRAIN SURGERY
R. HELMS and T. HAYES
Nov. 1982
MFS-25380 **Vol. 6, No. 2, P. 175**

Proposed brain-surgery tool has an octogonal fixture for positioning latex tube over incision. Eight stainless-steel wires embedded in latex extend to hold positioning fixture. Another eight are also embedded in the latex. Concentric sleeves are successively inserted into expandable latex tube. The first sleeve is placed over a solid rod. Last sleeve is a stainless-steel tube 1 inch in diameter. It is overcoated with Teflon (or equivalent) material.

B81-10177
IMPROVED METHOD FOR CULTURING GUINEA-PIG MACROPHAGE CELLS
J. SAVAGE (Alabama A&M University)
Nov. 1982 See Also NASA CR-158777(N79-27814/NSP)
MFS-25307 **Vol. 6, No. 2, P. 176**

Proper nutrients and periodic changes in culture medium maintain cell viability for a longer period. New method uses a thioglycolate solution, instead of mineral oil, to induce macrophage cells in guinea pigs and also uses an increased percent of fetal-calf bovine serum in cultivation medium. Macrophage cells play significant roles in the body's healing and defense systems.

B81-10178
AERIAL INFRARED PHOTOS FOR CITRUS GROWERS
C. H. BLAZQUEZ and F. W. J. HORN
Nov. 1982 See Also NASA RP-1067(N81-21437/NSP)
KSC-11209 **Vol. 6, No. 2, P. 176**

Handbook advises on benefits and methods of aerial photography with color infrared film. Interpretation of photographs is discussed in detail. Necessary equipment for interpretation is described--light table, magnifying lenses, and microfiche viewers, for example. Advice is given on rating tree condition; identifying effects of diseases, insects, and nematodes; and evaluating effects of soil, water, and weather.

B81-10296
CUFF FOR BLOOD-VESSEL PRESSURE MEASUREMENTS
M. SHIMIZU (National Research Council)
Dec. 1982
ARC-11264 **Vol. 6, No. 3, P. 291**

Pressure within blood vessel is measured by new cufflike device without penetration of vessel. Device continuously monitors blood pressure for up to 6 months or longer without harming vessel. Is especially useful for vessels smaller than 4 or 5 millimeters in diameter. Invasive methods damage vessel wall, disturb blood flow, and cause clotting. They do not always give reliable pressure measurements over prolonged periods.

B81-10297
ENVIRONMENTAL-ANALYSIS ROUTINE LIBRARY
K. PARKER (TRW, Co.) and J. TORIAN (TRW, Co.)
Dec. 1982
MSC-18925 **Vol. 6, No. 3, P. 292**

Program available from COSMIC contains library of routines that simulate environmental control and life support systems (ECLSS). Through interactive dialogue with program, user selects routines to be assembled into simulation of particular ECLSS under consideration. Program is modular, and allows addition of new routines as they are required.

06 MECHANICS

B81-10049
LESS-COSTLY INERTIAL GUIDANCE
S. J. MERHAV (National Research Council)
Sep. 1982
ARC-11257 **Vol. 6, No. 1, P. 51**

Two gyroscopes mounted in gimbals yield signals that allow calculation of velocity, position and altitude of an aircraft. The mass lowers center of gravity of gimbal-and-gyro assembly to below the intersection of their axes. Combination acts as a two-axis pendulum. Rate signals from the leveling gyroscope are integrated, amplified, and fed to gimbal torquers to restore pendulum to alinement with local vertical.

B81-10050
HIGH-SPEED LASER ANEMOMETER
J. A. POWELL, A. STRAZISAR, and R. SEASHOLTZ
Sep. 1982 See Also NASA TM-79320(N80-14375/NSP)
LEW-13527 **Vol. 6, No. 1, P. 52**

New high-speed laser anemometer system rapidly and efficiently maps gas-flow velocities within rotating blade rows of turbomachinery. Small seed particles entrained in gas flow fluoresce when they pass through probe volume, which is the fringe pattern formed by intersecting laser beams. Transit time of particles is obtained by use of suitable optics, photomultiplier tube and electronic signal processor. Data are then sent to a minicomputer.

B81-10051
CORRECTING FOR BACKGROUND IN FLOWING PLASMA MEASUREMENTS
M. R. CARRUTH, JR. (CALTECH)
Sep. 1982
NPO-15332 **Vol. 6, No. 1, P. 53**

Movable langmuir probe measures charge-exchange plasma density and flow in vicinity of an ion engine. Angular dependence of probe current is utilized to determine plasma flow direction at probe location. By rotating target, data are shown to be independent of target-sputtered ions.

B81-10052
DUAL-LASER SCHLIEREN SYSTEM
R. B. OWEN and W. K. WINTHEROW
Sep. 1982
MFS-25315 **Vol. 6, No. 1, P. 54**

Proposed schlieren system uses two lasers and two knife edges to simultaneously view perpendicular refractive-index gradients in a test volume. It is improvement over conventional schlieren systems, which monitor gradient along only one axis. Although originally developed to monitor materials-processing experiments in space, it should find application wherever there is need to study two-dimensional temperature, pressure, concentration or other gradients related to index of refraction.

B81-10053
FIBRE-OPTIC SEMICONDUCTOR TEMPERATURE GAGE
M. SHARMA (TRW, Inc.)
Sep. 1982 See Also NASA CR-160448(N80-17848/NSP)
MSC-18627 **Vol. 6, No. 1, P. 55**

'Safe' temperature gage for explosive liquids is based on optical transmission. Semiconductor crystal inserted between input and output optical fibers is temperature-sensing element in a new approach to measuring temperature of cryogens. Since no electrical components are immersed in liquid, new sensor minimizes danger of electrically ignited explosions in hazardous cryogens such as oxygen and hydrogen. Gage also useful for handling noncryogenic liquids in aircraft, automobiles, boats and water tanks.

B81-10054
DETECTING CRACKS ON INNER SURFACES
A. SAX (Rockwell International Corp.)
Sep. 1982
MFS-19575 **Vol. 6, No. 1, P. 56**

Microscopic cracks or flaws in surface of a workpiece are often detected with fluorescent dye. Dye is spread over surface to be inspected and then washed off. When piece is viewed under ultraviolet light, a glow is seen from dye trapped in any flaws. Intensity of fluorescence gives a rough indication of depth of defect. Fluorescent inspection procedure is fast, inexpensive and simple to perform.

B81-10055
VISCOUS TORQUES ON A LEVITATING BODY
F. BUSSE (CALTECH) and T. WANG (CALTECH)
Sep. 1982
NPO-15413 **Vol. 6, No. 1, P. 56**

New analytical expressions for viscous torque generated by orthogonal sound waves agree well with experiment. It is possible to calculate torque on an object levitated in a fluid. Levitation has applications in containerless materials processing, coating, and fabrication of small precision parts. Sound waves cause fluid particles to move in elliptical paths and induce azimuthal circulation in boundary layer, giving rise to time-averaged torque.

B81-10056
ADHESIVE-BONDED TAB ATTACHES THERMOCOUPLES TO TITANIUM
C. F. COOK
Sep. 1982
FRC-11017 **Vol. 6, No. 1, P. 57**

Mechanical strength of titanium-alloy structures that support thermocouples is preserved by first spotwelding thermocouples to titanium tabs and then attaching tabs to titanium with a thermosetting adhesive. In contrast to spot welding, a technique previously used for thermocouples, fatigue strength of the titanium is unaffected by adhesive bonding. Technique is also gentler than soldering or attaching thermocouples with a tap screw.

B81-10057
INTERFEROMETER ACCURATELY MEASURES ROTATION ANGLE
P. O. MINOTT
Sep. 1982
GSC-12614 **Vol. 6, No. 1, P. 58**
Interference fringes from superimposed beams move across a photodetector, creating electrical pulses. Frequency of pulses is direct measure of angular velocity of rotating body. If separation of the sources changes, it affects separation of all fringes equally and does not affect angular velocity measurement.

B81-10058
ULTRASONIC TRANSDUCER ANALYZER
M. K. GROUNDS (M&S Computing, Inc.)
Sep. 1982
MFS-25410 **Vol. 6, No. 1, P. 59**
Ultrasonic transducer-beam-intensity distributions are determined by analyzing echoes from a spherical ball. Computers control equipment and process data. Important beam characteristics, such as location of best beam focus and beam diameter at focus, can be determined quickly from extensive set of plots generated by apparatus.

B81-10059
FAR-FIELD ANTENNA PATTERN FROM A NEAR-FIELD TEST
Y. RAHMAT-SAMII (CALTECH), V. GALINDO-ISRAEL (CALTECH), and R. MITTRA (University of Illinois)
Sep. 1982
NPO-14905 **Vol. 6, No. 1, P. 60**
Plane/polar geometry simplifies measurement of near-field data for this antenna and allows a determination of far-field pattern by Jacobi-Bessel series expansion of data. Measuring probe is an undersized, dielectrically loaded and open-ended waveguide with a far-field pattern similar to that of a small magnetic dipole in its forward directions, making it unnecessary to rotate probe in direction similar to antenna rotation.

B81-10060
HEAT PIPE BLOCKS RETURN FLOW
J. E. ENINGER (TRW, Inc.)
Sep. 1982 See Also NASA CR-152183(N78-33379/NSP)
ARC-11285 **Vol. 6, No. 1, P. 61**
Metal-foil reed valve in conventional slab-wick heat pipe limits heat flow to one direction only. With sink warmer than source, reed is forced closed and fluid returns to source side through annular transfer wick. When this occurs, wick slab on sink side of valve dries out and heat pipe ceases to conduct heat.

B81-10061
NOZZLE MODIFICATION SUPPRESSES FLOW TRANSIENTS
G. V. R. RAO (Rockwell International Corp.)
Sep. 1982
MFS-19567 **Vol. 6, No. 1, P. 62**
Proposal for steadying flow from rocket nozzle on Space Shuttle main engine could be applied to other large-area-ratio contoured nozzles. Oscillations and pulsations in boundary-layer flow would be reduced by flaring nozzle exit. Transient side loads on nozzle would be suppressed. Large pressure gradients and eddies that can lead to fluctuations are suppressed. Exact radius of curvature of corner would depend on shear-layer thickness.

B81-10062
MICROCOMPUTER CHECKS BUTT-WELD ACCURACY
W. CLISHAM (Martin Marietta Aerospace), W. GARNER (Martin Marietta Aerospace), C. COHEN (Martin Marietta Aerospace), J. BEAL (Martin Marietta Aerospace), R. POLEN (Martin Marietta Aerospace), and J. LLOYD (Martin Marietta Aerospace)
Sep. 1982
MFS-25557 **Vol. 6, No. 1, P. 62**
Electrical gage and microcomputer eliminate time-consuming manual measurements. Alinement and angle of plates on either side of butt weld are measured and recorded automatically by hand-held gage and desk-top microcomputer. Gage/micro-computer quickly determine whether weld is within dimensional tolerances or whether reworking is needed. Microcomputer prints out measurements while operator moves gage from point to point along weld. Out-of-tolerance measurements are marked by an asterisk on printout.

B81-10063
SELF-CORRECTING ELECTRONICALLY-SCANNED PRESSURE SENSOR
C. GROSS and T. BASTA
Sep. 1982
LAR-12686 **Vol. 6, No. 1, P. 63**
High-data-rate sensor automatically corrects for temperature variations. Multichannel, self-correcting pressure sensor can be used in wind tunnels, aircraft, process controllers and automobiles. Offers data rates approaching 100,000 measurements per second with inaccuracies due to temperature shifts held below 0.25 percent (nominal) of full scale over a temperature span of 55 degrees C.

B81-10064
LACQUER REVEALS IMPACT DAMAGE IN COMPOSITES
M. D. RHODES and J. G. WILLIAMS
Sep. 1982
LAR-12700 **Vol. 6, No. 1, P. 64**
Brittle lacquer unveils effects normally visible only by ultrasonic inspection. Laquer coating measures spread of cracking and delamination in graphite/epoxy panels subjected to cyclic compression loads after impact damage. Test specimen is coated with lacquer on side opposite surface at which projectile will be fired. Spalled area shows effect of impact without removing specimen from test fixture.

B81-10065
MEASURING CYCLIC-STRESS PROPERTIES OF PRESSURE VESSELS
C. F. FIFTAL (Martin Marietta Corp.)
Sep. 1982
MFS-23734 **Vol. 6, No. 1, P. 65**
Simulated-service cycle differs from conventional proof-test cycle in that specimen is subjected to sine-wave variation of stress instead of prolonged steady stress. Simulated-service testing is performed at low and high temperatures as well as at room temperatures. (Flaws initiated by severe stresses of proof testing can later develop into leaks during service, thus effectively reducing useful service life.) Method may be useful for commercial thin-wall vessels.

B81-10066
MATCHING OF APPARENT-STRAIN CHARACTERISTICS
T. C. MOORE
Sep. 1982
LAR-12743 **Vol. 6, No. 1, P. 66**
Strain gages are temporarily bonded to surface of test block. Apparent strain is recorded in excursion to -190 degrees C, and gages are disbonded following heating to elevated temperature. Matching strain gages for cryogenic use has several advantages. Initial accuracy for cryogenic transducers is greatly improved, less apparent-strain correction wire is required and there are smaller errors due to loop data caused by long pieces of correction wire.

B81-10067
PRESSURE SWITCH IS A LOW COST BATTERY INDICATOR
J. L. ABITA (John Hopkins Univ.)
Sep. 1982
GSC-12679 **Vol. 6, No. 1, P. 67**
Conventional pressure switch, fabricated by printed-

circuit manufacturing techniques, can indicate when charge on battery departs from preset level. Membrane on switch is exposed to internal pressure of battery, which varies according to stored charge. When pressure varies from preset level, switch can turn on a light-emitting diode or similar indicator to warn user that battery is low.

B81-10068
PULSED PHASE-LOCKED-LOOP STRAIN MONITOR
J. S. HEYMAN and F. D. STONE
Sep. 1982
LAR-12772 **Vol. 6, No. 1, P. 68**

P2sup.L2sup. strain monitor measures strain by monitoring change in phase of acoustic signal that passes through stressed sample. Phase sample causes shift in frequency of VCO. As with other monitors of this type, instrument is only accurate in elastic range of material. Monitor is expected to have broad application in materials testing, structural design, fabrication and assembly.

B81-10069
STRAIN-GAGED BOLTS ARE EASILY PREPARED
R. L. WALKER (Rockwell International Corp.)
Sep. 1982
MSC-18823 **Vol. 6, No. 1, P. 69**

New method for installing strain gages in structural bolts is implemented as standard workbench procedure. Rather than potting gages in a hole along axis of bolt, gages are first installed on outside of plastic carrier tube. Tube is then epoxied in axial hole. Procedure can be used to prepare gages to monitor bolt tension, shear, or torsion.

B81-10070
LOAD-DISPLACEMENT MEASUREMENT ON PIN-LOADED SPECIMENS
D. M. FISHER and R. BUZZARD
Sep. 1982 See Also NASA TM-81379(N80-13513/NSP) and NASA TN-D-3724(N6710749/NSP)
LEW-13624 **Vol. 6, No. 1, P. 70**

Tubes apply as displacement is registered by long armed, double-cantilever gage. Sharp points at ends of arms protrude through holes in tube walls and contact center of area of load applications. Method was devised for determining load point displacement accurately. No extraneous displacement fraction is present in measurement, and data-correction procedures are unnecessary.

B81-10071
HEAT-ENERGY ANALYSIS FOR SOLAR RECEIVERS
F. L. LANSING (CALTECH)
Sep. 1982
NPO-14835 **Vol. 6, No. 1. P. 70**

Heat-energy analysis program (HEAP) solves general heat-transfer problems, with some specific features that are 'custom made' for analyzing solar receivers. Can be utilized not only to predict receiver performance under varying solar flux, ambient temperature and local heat-transfer rates but also to detect locations of hotspots and metallurgical difficulties and to predict performance sensitivity of neighboring component parameters.

B81-10072
PROGRAM FOR ANALYSIS AND RESIZING OF STRUCTURES
R. T. HAFTKA (Illinois Institute of Technology), B. PRASAD (Illinois Institute of Technology), and U. TSACH (Illinois Institute of Technology)
Sep. 1982
LAR-12704 **Vol. 6, No. 1, P. 71**

Program for Analysis and Resizing of Structures (PARS) determines optimum resizing of structures subject to stress, displacement, and flutter constraints. Is an efficient code for sizing large- or small-scale finite-element models in presence of strength, thermal, and aeroelastic constraints with minimum and maximum bounds on structural dimensions. PARS is composed of individual processors that are executed in a logical sequence to perform analysis or synthesis.

B81-10073
UNSTEADY SUBSONIC LOADINGS DUE TO CONTROL-SURFACE MOTION
W. S. ROWE (The Bowing Co.)
Sep. 1982
LAR-12802 **Vol. 6, No. 1, P. 71**

RHOIV computer program predicts unsteady lifting-surface loadings caused by motions of leading edge and trailing-edge control surfaces having sealed gaps at hinge lines and side edges. Analysis is based on linear, subsonic, potential-flow theory using kernel function method. Linear combinations of pressure distributions are used that are continuous except at planform edges and hinge lines. Loading solution is obtained by downwash collocation for deflection or motion of main wing and control surfaces.

B81-10074
AERODYNAMICS OF SOUNDING-ROCKET GEOMETRIES
J. BARROWMAN
Sep. 1982
GSC-12680 **Vol. 6, No. 1, P. 72**

Theoretical aerodynamics program TAD predicts aerodynamic characteristics of vehicles with sounding-rocket configurations. These slender, Axisymmetric finned vehicles have a wide range of aeronautical applications from rockets to high-speed armament. TAD calculates characteristics of separate portions of vehicle, calculates interference between portions, and combines results to form total vehicle solution.

B81-10075
AEROELASTIC ANALYSIS FOR ROTORCRAFT
W. JOHNSON
Sep. 1982
ARC-11150 **Vol. 6, No. 1, p. 72**

Aeroelastic-analysis computer program incorporates an analytical model of aeroelastic behavior of wide range of rotorcraft. Such an analytical model is desirable for both pretest predictions and posttest correlations. Program can be applied in investigations of isolated rotor aeroelasticity and helicopter-flight dynamics and could be employed as basis for more-extensive investigations or aeroelastic behavior, such as automatic control system design.

B81-10179
FLIGHT-MANAGEMENT ALGORITHM FOR FUEL-CONSERVATIVE DESCENTS
C. E. KNOX and D. G. CANNON (Boeing Commercial Airplane Co.)
Nov. 1982 See Also NASA TP-1717(N80-33404/NSP)
LAR-12814 **Vol. 6, No. 12, P. 179**

Federal Aviation Administration has developed an automated time-based metering form of air traffic control for arrivals into terminal area called local flow management/profile descent (LFM/PD). LFM/PD saves fuel by matching airplane arrival flow to airport acceptance rate through time-control computations and by allowing pilot to descend at his discretion from cruise altitude to metering fix in an idle-thrust, clean configuration (landing gear up, flaps zero, speed brakes retracted).

B81-10180
MOISTURE IN COMPOSITES IS MEASURED BY POSITRON LIFETIME
J. J. SINGH, W. H. HOLT (Naval Surface Weapons Center), and W. J. MOCK (Naval Surface Weapons Center)
Nov. 1982 See Also NASA TP-1681(N80-27428/NSP)
LAR-12776 **Vol. 6, No. 2, P. 180**

New technique is expected to measure the moisture content and moisture depth distribution in fiber-reinforced polymeric composites. Technique is based on dependence of positron lifetime on moisture content of composite specimen. None of the previous non-destructive testing

techniques measured moisture content and depth distribution simultaneously.

B81-10181
LASER/HETERODYNE MEASUREMENT OF TEMPERATURE AND SALINITY
D. J. JOBSON, C. L. FALES, and S. J. KATZBERG
Nov. 1982
LAR-12766 **Vol. 6, No. 2, P. 181**

Proposed visible-light laser/heterodyne receiver would remotely measure temperature and salinity of subsurface water. Operation is based on acoustic/optical scattering of light by sound waves. Application of this concept is foreseen in current research on energy conversion from ocean currents produced by thermal gradients and on future marine remote-sensing program.

B81-10182
WINGTIP-VORTEX TURBINE LOWERS AIRCRAFT DRAG
J. C. J. PATTERSON
Nov. 1982
LAR-12544 **Vol. 6, No. 2, P. 182**

Turbine captures some of energy lost in aircraft wingtip vortexes. Wing-tip vortex turbine operates in crossflow of the lift-induced vortex; i.e., flow not parallel to the flightpath. Each turbine blade generates a force as a result of angle of attack between blade and nonstreamwise local flow. Turbine converts lost vortex energy to rotational energy and reduces induced drag.

B81-10183
ENGINE-VIBRATION ANALYZER
V. R. TOLMEI (Rockwell International Corp.)
Nov. 1982
MFS-19320 **Vol. 6, No. 2, P. 183**

Proposed circuit would monitor vibration spectrum of engines under test or in service. It could detect subtle out-of-specification conditions and could be programed to shut down engine if an out-of-limits condition develops. Possible uses of monitor are in bench testing automobiles and outboard motors and as a safety device in very critical engine applications.

B81-10184
TIRE TEMPERATURE AND PRESSURE MONITOR
I. O. MACCONOCHIE and A. G. BESWICK
Nov. 1982
LAR-19262 **Vol. 6, No. 2, P. 184**

Wheel-mounted miniature transmitter would signal dangerous conditions to the driver or pilot. Monitor would include a sensor and a radio transmitter mounted so as not to imbalance the wheel. Sensor and batteries are enclosed in a plastic housing on the rim. Also has possibilities as a research tool for experiements on vehicle safety.

B81-10185
ORIFICE BLOCKS HEAT PIPE IN REVERSE MODE
J. P. ALARIO (Grumman Aerospace Corp.)
Nov. 1982
ARC-11341 **Vol. 6, No. 2, P. 185**

High forward-mode conductance is combined with rapid reverse-mode shutoff in a heat pipe originally developed to cool spacecraft payloads. A narrow orifice within the pipe 'chokes off' the evaporator if heat sink becomes warmer than source. During normal operation, with source warmer than sink, orifice has little effect. Design is simpler and more compact than other thermal-diode heat pipes and requires no special materials, forgings, or unusual construction techniques.

B81-10186
RANGEFINDER CORRECTS FOR AIR DENSITY AND MOISTURE
J. B. ABSHIRE
Nov. 1982
GSC-12609 **Vol. 6, No. 2, P. 186**

Proposed distance-measuring instrument compensates for variations in both dry atmospheric density and water-vapor content. Instrument would be expected to be more accurate than previous laser-ranging instruments. New rangefinder sends three signal trains to target: Two trains are at optical frequencies, and one is at a microwave frequency. All three signals are phase-locked.

B81-10187
FASTER TEST FOR CABLE SEALS
A. T. SHEPHARD (Martin Marietta Corp.)
Nov. 1982
MFS-25618 **Vol. 6, No. 2, P. 187**

Vacuum-assisted immersion test is much faster than conventional atmospheric immersion tests of cable seals. Vacuum speeds removal of air, allowing its replacement by conductive salt solution in leaking specimens. Previously, 24-hour immersion was necessary to assure displacement of trapped air. Improved method takes only 10 minutes.

B81-10188
CIRCUIT COUNTS CARBON FIBERS
L. C. YANG (CALTECH)
Nov. 1982
NPO-14940 **Vol. 6, No. 2, P. 188**

Carbon fibers are counted when they fall on high-voltage grid. An arc discharge vaporizes fiber and triggers timer. The equal-duration pulses from timer are integrated by operational amplifier, giving an output voltage that is proportional to the number of fibers incident after reset switch was opened. If two or more fibers arrive at grid simultaneously, they are vaporized one at a time; thus all of them are counted.

B81-10189
MULTIPRESSURE AND TEMPERATURE PROBE
K. R. RAMAN (Raman Aeronautics Research)
Nov. 1982
ARC-11166 **Vol. 6, No. 2, P. 189**

Aerodynamic probe is a small cylinder tube holding a network of tiny tubes leading to various ports. Six parameters are recorded simultaneously with little interference with aerodynamic flow. Two tubes connected by a hot-wire tungsten probe sense steady and fluctuating components of total and static pressures; the feedbacks from these tubes are input into differential-pressure sensors to measure fluctuating components of the pressures. Data are recorded by instruments at the back end of the probe.

B81-10190
SURFACE-CONTAMINATION INSPECTION TOOL FOR FIELD USE
T. SMITH (Rockwell International Corp.)
Nov. 1982
MFS-25581 **Vol. 6, No. 2, P. 190**

Inspection tool detects surface contamination by measuring photoelectron emission. No vacuum chamber or controlled environment is used. Photoemission is measured under ordinary atmospheric conditions, so surfaces may easily be inspected in factories or in the field.

B81-10191
PRESSURE TRANSDUCER HAS LONG SERVICE LIFE
R. E. PROUT (Rockwell International Corp.) and A. J. CHAVES (Moog, Inc.)
Nov. 1982
MSC-18904 **Vol. 6, No. 2, P. 191**

Differential-pressure transducer includes a piston, helical springs, and a linear variable-differential transformer concentric with piston. Transducer senses motion of piston in response to changes in pressure differential. Eight seals within the transducer prevent fluid leakage from one pressure line to the other. Reliability and operating life of the new unit are superior to many conventional transducers.

B81-10192
HEATER COMPOSITE MEASURES HEAT TRANSFER
S. A. HIPPENSTEELE, L. M. RUSSEL, F. S. STEPKA, and R. J. MOFFAT (Stanford University)
Nov. 1982 See Also NASA TM-81639(N81-21313/NSP)
LEW-13731 **Vol. 6, No. 2, P. 192**

Composite consisting of commercially available elements has been developed to measure heat transfer. Composite provides a simple, convenient, low-cost device for use in heat-transfer work for rapid evaluation of thermal performance of both flat and simply curved objects. Device utilizes available off-the-shelf materials and provides a convenient method, with good resolution of local temperatures and heat transfer, with measurement accuracy at near-normal room conditions.

B81-10193
SURVEY OF FACILITIES FOR TESTING PHOTOVOLTAICS
R. W. WEAVER (CALTECH)
Nov. 1982
NPO-15361 **Vol. 6, No. 2, P. 192**

42-page report describes facilities capable of testing complete photovoltaic systems, subsystems, or components. Compilation includes facilities and capabilities of five field centers of national photovoltaics program, two state-operated agencies, and five private testing laboratories.

B81-10194
GRAPHICS FOR FINITE-ELEMENT ANALYSIS
E. A. THORNTON (Old Dominion University Research Foundation) and L. M. SAWYER (Old Dominion University Research Foundation)
Nov. 1982
LAR-12793 **Vol. 6, No. 2, P. 193**

ELPLOT program is a passive computer graphics system that could be utilized for display of models and responses of general finite-element analyses. Program includes: Wide range of view-orientation selections, number of alternative data-input formats, extensive family of finite-element types, and capabilities for both static and dynamic-response displays.

B81-10195
FINITE-ELEMENT ANALYSIS OF FORCED CONVECTION AND CONDUCTION
A. R. WIETING
Nov. 1982
LAR-12794 **Vol. 6, No. 2, P. 193**

TAP2 thermal-analysis program was developed as part of research on finite element methodology for thermal analysis of convectively cooled structures, such as scramjet engines and hypersonic aircraft. Program simplifies computations when both structural and thermal analyses are required and is suited for thermal analysis of nuclear reactors and solar-panel heating systems.

B81-10196
MODEL VERIFICATION OF MIXED DYNAMIC SYSTEMS
D. A. EVENSEN (J. W. Wiggins Co.), J. D. CHROSTOWSKI (J. W. Wiggins Co.), and T. K. HASSELMAN (J. W. Wiggins Co.)
Nov. 1982
MFS-23806 **Vol. 6, No. 2, P. 194**

MOVER uses experimental data to verify mathematical models of 'mixed' dynamic systems. The term 'mixed' refers to interactive mechanical, hydraulic, electrical, and other components. Program compares analytical transfer functions with experiment.

B81-10197
IMPROVED NUMERICAL DIFFERENCING ANALYZER
J. T. SKLADANY
Nov. 1982
GSC-12671 **Vol. 6, No. 2, P. 194**

SINDA, Systems Improved Numerical Differencing Analyzer, solves differential and algebric equations representing physical systems. SINDA solves numerically almost any set of ordinary differential equations that represent transient behavior of a lumped-parameter system or any set of nonlinear algebraic equations that represents the steady state conditions of a physical system.

B81-10198
SIMPLIFIED THERMAL ANALYZER --VAX VERSION
J. T. SKLADANY
Nov. 1982
GSC-12698 **Vol. 6, No. 2, P. 195**

DEC VAX 11/780 version of the Simplified Shuttle Payload Thermal Analyzer (SSPTA) aids in evaluating thermal design of instruments to be flown in the Space Shuttle cargo bay. SSPTA is a collection of programs that are currently used in thermal analysis of spacecraft, modified for quick, preliminary analysis of payloads.

B81-10199
AERODYNAMICS OF SUPERSONIC AIRCRAFT
W. D. MIDDLETON (The Boeing Co.), J. L. LUNDRY (The Boeing Co.), and R. G. COLEMAN (The Boeing Co.)
Nov. 1982
LAR-12857 **Vol. 6, No. 2, P. 195**

An integrated system for the analysis of supersonic configurations consists of an executive driver and eight basic computer programs that build up force coefficients of an selected configuration. System employs modified linearized theory for calculation of surface pressures and employs supersonic-area-rule concepts in combination with linearized theory for calculation of aerodynamic force coefficients.

B81-10200
DYNAMIC-LOADS ANALYSIS OF FLEXIBLE AIRCRAFT WITH ACTIVE CONTROLS
B. I. PERRY and B. J. DURLING
Nov. 1982
LAR-12747 **Vol. 6, No. 2, P. 196**

Integrated system of stand-along computer programs, DYLOFLEX, analyzes dynamic loads on flexible aircraft with active controls. DYLOFLEX capabilities include calculating dynamic loads due to continuous atmospheric turbulence, discrete gusts, and discrete control inputs. Each of the eight individual DYLOFLEX programs may be used alone or in conjunction with other DYLOFLEX programs.

B81-10298
FAST-ACTING ELECTROHYDRAULIC SERVO
J. A. J. WEBB, O. MEHMED, and C. F. LORENZO
Dec. 1982 See Also NASA TP-1678(N80-29369/NSP)
LEW-13730 **Vol. 6, No. 3, P. 295**

Electrohydraulic servo controls moving elements of airflow valve. Position of moving element and attached piston is monitored by linear variable-differential transformer (LVDT). Single-stage servo valve lets fluid into and out of piston volume in response to feedback signals from the LVDT.

B81-10299
IMPROVED MAGNETIC-FIELD-COMPONENT RESOLVERS
H. D. GARNER
Dec. 1982
LAR-12638 **Vol. 6, No. 3, P. 296**

New resolvers for vectorially summing outputs of aircraft-mounted magnetometers are lighter and more economical to fabricate than conventional electromagnetic resolvers. One resolver is based on potentiometric principles, the second uses polarization filters, and the third has variable-capacitance elements. Optical, capacitive and potentiometric devices have applications in aircraft navigation systems.

B81-10300
SIMPLE MAGNETOMETER FOR AUTOPILOTS

H. D. GARNER
Dec. 1982
LAR-12832 **Vol. 6, No. 3, P. 297**
Simple, low-cost magnetometer is suitable for heading-reference applications in autopilots and other directional control systems. Sensing element utilizes commercially available transformer core; and supporting electronics consist of one transistor, two readily-available integrated-circuit chips, and associated resistors and capacitors.

B81-10301
ULTRASONIC INSTRUMENT FOR EVALUATION OF COMPOSITES
A. VARY and A. GREEN (Acoustic Emission Technology Corp.)
Dec. 1982
LEW-13716 **Vol. 6, No. 3, P. 298**
Ultimate strength of composite material is related to normalized stress-wave factor, a measure of attenuation of stress wave. New portable ultrasonic inspection instrument measures strength of composite materials. New commercial instrument has similar specifications to prototype developed at Lewis Research Center. Device may ultimately help to reduce energy consumption and improve efficiencies of vehicles by allowing use of composite materials to their full potential in critical application areas.

B81-10302
SMALL FIXTURE STRAINS COMPOSITES FOR ENVIRONMENTAL TESTS
F. W. TERVET (CALTECH)
Dec. 1982
NPO-15062 **Vol. 6, No. 3, P. 298**
Fixture for long-term strain tests of composites is based on inexpensive tool for repairing motorcycle chains. (In normal use tool forces rivet out of chain element.) As modified for composite testing, tool has precision screw and shim. Qualification tests for graphite/epoxy composites are made less expensive by simple test fixture. Used in quantity, fixtures apply precisely similar loads to many samples.

B81-10303
SOLUTION ACCOUNTS FOR STRUCTURAL DAMPING
L. A. ROUSSOS, M. W. HYER (Virginia Polytechnic Institute and State University), and E. A. THORNTON (Old Dominion University)
Dec. 1982
LAR-12863 **Vol. 6, No. 3, P. 299**
New analytical technique determines dynamic response of damped structures dominated by internal structural damping mechanisms. Though structural damping is often negligible compared with damping due to air friction and friction in joints, structural damping can be of major importance in structures having heavy damping treatments or in outer-space structures. Finite-element model includes nonlinear, nonviscous internal damping.

B81-10304
TILE-GAP MEASUREMENT TOOL
D. H. HELMAN (Rockwell International Corp.) and A. R. KEIR (Rockwell International Corp.)
Dec. 1982
MSC-20057 **Vol. 6, No. 3, P. 300**
Hand-held tool measures small gaps between tiles rapidly and accurately, even when gap is tapered or indented below surface. Tool indicates gap dimensions on calibrated disk. Measurements are accurate within plus or minus 0.003 inch. Tool was developed for determining gap between tiles on Space Shuttle, but may be of use in other applications requiring precise setting of gaps between tiles or other structures.

B81-10305
GAGE FOR SURFACE WAVINESS
G. W. WILLIAMS (Rockwell International Corp.)
Dec. 1982
MSC-20055 **Vol. 6, No. 3, P. 301**
New device gives qualitive readings of flatness, curvature, or waviness of surface. Designed to check for waviness in surface of Space Shuttle prior to installation of heat-resistant tiles, it could be used to measure regularity or irregularity of other surfaces. Irregularities are measured by noting readings of three dial indicators on simple, inexpensive instruments.

B81-10306
NEW CONFIGURATION FOR COMPRESSION-TEST FIXTURE
G. C. SHANKS (McDonnell Douglas Corp.)
Dec. 1982
MSC-18723 **Vol. 6, No. 3, P. 301**
Gravity-loades axial-compression test fixture is operated by raising lower platen and specimen against weighted upper platen. Wheel turns nut on threaded rod to move lower platen up or down. Limiting rods prevent further upward movement if sample buckles.

B81-10307
MASS-LOSS BUTTONS MONITOR MATERIAL DEGRADATION
C. N. WEBSTER (Vought Corp.)
Dec. 1982
MSC-18903 **Vol. 6, No. 3, P. 302**
Small button-sized samples attached to parent materials are simple way of monitoring degradation of parent in harsh environments. Samples determine effects of multiple exposures to environmental extremes without disturbing fit or function of parent. They are less costly and more convenient than complex instrumentation normally required to measure complete temperature/pressure time history of parent component.

B81-10308
HOT FILM STATIC-PRESSURE PROBE FOR FLOW-FIELD SURVEYS
L. M. WEINSTEIN and G. C. J. ASHBY
Dec. 1982
LAR-12799 **Vol. 6, No. 3, P. 303**
New hot film static pressure probe significantly reduces response time in flow-field surveys during wind-tunnel tests. Probe incorporates two hot film sensors, unheated film for temperature compensation and heated film for pressure measurement, and sonic orifice for flow control. Hot film prove measures static pressure while compensating for gas temperature.

B81-10309
PREDICTING THE STRENGTHS OF ANGLE-PLIED LAMINATES
C. C. CHAMIS
Dec. 1982 See Also NASA TM-81404(N80-16107/NSP)
LEW-13733 **Vol. 6, No. 3, P. 304**
Simplified convenient procedure has been developed that can be used to determine elastic and strength properties of angle-plied laminates. Method is suitable for use with pocket calculator. Consists of simple equations and graphs of ply combinations from most frequently used composites. Procedure makes use of well-known transformation equations, ply stress influence coefficients, and ply uniaxial composites including interply and intraply hybrids.

B81-10310
IMPROVED TENSILE TEST FOR CERAMICS
R. A. OSIECKI (Lockheed Missiles & Space Co., Inc.)
Dec. 1982
MSC-20105 **Vol. 6, No. 3, P. 304**
For almost-nondestructive tensile testing of ceramics, steel rod is bonded to sample of ceramic. Assembly is then pulled apart in conventional tensile-test machine. Test destroys only shallow surface layer which can be machined away making specimen ready for other uses. Method

should be useful as manufacturing inspection procedure for low-strength brittle materials.

B81-10311
PREDICTING TENSILE STRENGTHS OF BORON/ ALUMINUM COMPOSITES
J. A. DECARLO
Dec. 1982 See Also NASA TM-81474(N80-21452/NSP)
LEW-13745 **Vol. 6, No. 3, P. 305**

To develop predictive theory to account for time/ temperature effect of B/A1 composites, series of deformation and fracture studies was performed on commercial boron fibers over wide ranges of stress, stress application time, and temperature. By combining these single fiber results with fracture theory for metal matrix composites, design formulas were derived that describe B/A1 composite tensile and stress rupture strengths as function of time and temperature. Using derived formulas, calculated and experimental results agree to within 3 percent.

B81-10312
DOUBLE-ADHESIVE TAPE TEST REDUCES WASTE
L. C. LEE (Vought Corp.) and M. W. REED (Vought Corp.)
Dec. 1982
MSC-20047 **Vol. 6, No. 3, P. 306**

New method for testing peel strength of particular thermal-control tape used on Space Shuttle orbiter radiators requires only half amount of tape of method previously employed. Thermal-control tape consists of layers of FEP, silver, Inconel metal, adhesive, Kapton Film, and second adhesive layer. Method also avoids cost of labor and materials to prepare second test coupon and can be adapted for testing other types of double-faced adhesive tapes in military, industrial and consumer applications.

B81-10313
DETECTING CONTAMINATION WITH PHOTOELECTRON EMISSION
T. SMITH (Rockwell International Corp.)
Dec. 1982
MFS-25619 **Vol. 6, No. 3, P. 307**

Photoelectron emission from aluminum or epoxy-painted aluminum can be used to reveal presence and concentration of surface contaminants. Emission can be used to locate those parts of surface that are excessively contaminated and to which coatings cannot be reliably bonded. Cleaning can then be done on areas that most need it. Probe moves at rate of typically 1 ft/s (30 cm/s), speed slow enough to ensure sensitivity but fast enough to keep scanning time within reasonable limit.

B81-10314
NEW APPARATUS TESTS PRESSURE-SUIT JOINTS
H. C. VYKUKAL and B. WEBBON
Dec. 1982
ARC-11314 **Vol. 6, No. 3, P. 308**

New apparatus measures applied torque and angle-of-flexure in pressurized flexible joints, such as those found in diving suits and flight suits. Torque and flexure are permanently recorded on x-y plotter. Family of curves can be taken as function of suit pressure or other variables. Apparatus could also measure torque-versus-angle in mechanical linkages.

B81-10315
MODULAR ENGINE INSTRUMENTATION SYSTEM
W. J. RICE and A. G. BIRCHENOUGH
Dec. 1982 See Also NASA TP-1757(N81-11315/NSP)
LEW-13729 **Vol. 6, No. 3, P. 309**

System that provides information and measurements never obtained before in real time has been developed. System shows not only real-time measurements but also results of computations of key combustion parameters in meaningful and easily understood display. Standard commercially-available shaft encoder plus data from pressure transducer act as principal drivers to device. Eventually, modular system could be developed into onboard controller for automobile engines.

B81-10316
ALBORITHM FOR UNSTEADY POTENTIAL FLOW ABOUT AIRFOILS
R. CHIPMAN (Grumman Aerospace Corp.)
Dec. 1982
ARC-11378 **Vol. 6, No. 3, P. 310**

Implicit finite-difference scheme efficiently computes unsteady potential flow about airfoils. Formulation uses density and velocity potential as dependent variables. Conservation form is retained to assure that shock wave location and speed are computed correctly. Scheme fills need for method to calculate efficiently unsteady potential flow about airfoils and to predict flutter and other unsteady aeroelastic phenomena in transonic flow regimes.

B81-10317
USING NOMARSKI INTERFERENCE TO DETECT MICROCRACKS IN GLASS
C. M. J. FLEETWOOD
Dec. 1982
GSC-12649 **Vol. 6, No. 3, P. 310**

Nomarski interference-contrast microscopy has been proposed as technique for detecting, measuring, and observing Griffith microcracks in glass and glasslike substances. Would facilitate research into cause and elimination of these flaws, along with short-and long-term effects of temperature, humidity, and other conditions. Nomarski interference-contrast technique is expected to find wide use in inspection of glass and other materials.

B81-10318
TORQUE SIMULATOR FOR ROTATING SYSTEMS
W. T. DAVIS
Dec. 1982
LAR-12751 **Vol. 6, No. 3, P. 311**

New torque brake simulates varying levels of friction in bearings of rotating body. Rolling-tail torque brake uses magnetic force to produce friction between rotating part and stationary part. Simulator electronics produce positive or negative feedback signal, depending on direction of rotation. New system allows for first time in-depth study of effects of tail-fin spin rates on pitch-, yaw-, and roll-control characteristics.

B81-10319
EXPLOSIVELY ACTUATED OPENING FOR RAPID EGRESS
L. J. BEMENT, J. W. BAILEY (LTV Corp.), and R. PERRY (LTV Corp.)
Dec. 1982 See Also NASA TM-80235(N80-21293/NSP)
LAR-12624 **Vol. 6, No. 3, P. 312**

Flexible linear-shaped charge provides explosive energy to create opening and to jettison panel. Container around explosive charge protects pilot from effects of explosion. Exterior steel strip receives most of force of explosion to jettison severed panel. System allows pilot to bail out from left side of airplane by creating opening where no door exists. Egress system is simple and highly responsive, requiring minimal modifications to airplane.

B81-10320
VIBRATION ANALYSIS WITH FINITE DYNAMIC ELEMENTS
K. K. GUPTA (CALTECH)
Dec. 1982
NPO-15087 **Vol. 6, No. 3, P. 313**

To enhance usefulness of computers in solving engineering problems, new techniques are being developed for numerical analysis of structural dynamics. Two aspects of this analysis--structural discretization with finite dynamic elements and solution of resulting equations--have been applied in detail to membrane and plane stress/strain continua.

B81-10321
ELASTIC SURFACE WRINKLING
M. ZAK (CALTECH)
Dec. 1982
NPO-15091 **Vol. 6, No. 3, P. 313**
Instability phenomena in elastic surfaces subject to compressive stresses are examined theoretically in new report. Theory is potentially applicable to such practical problems as aircraft panel flutter, nondestructive testing, piezoelectric transducer design, distortion of optical surfaces, and tolerance studies of very precise machine parts.

B81-10322
STRUCTURAL DESIGN WITH STRESS AND BUCKLING CONSTRAINTS
J. KIUSALAAS (The Pennsylvania State University) and G. B. REDDY (The Pennsylvania State University)
Dec. 1982
MFS-25234 **Vol. 6, No. 3, P. 314**
DESAP 2 synthesizes linear-elastic structures under static loads. Objective is to find element sizes (cross-sectional areas, plate thicknesses, and the like) that minimize total structural weight without changing layout of structure. Weight is minimized for given layout subject to prescribed contstraints.

B81-10323
PLASTIC AND LARGE-DEFLECTION ANALYSIS OF NONLINEAR STRUCTURES
R. G. THOMSON, R. J. HAYDUK, M. P. ROBINSON, B. J. DURLING, A. PIFKO (Grumman Aerospace Corp.), H. S. LEVINE (Grumman Aerospace Corp.), H. J. ARMEN (Grumman Aerospace Corp.), A. LEVY (Grumman Aerospace Corp.), and P. OGILVIE (Grumman Aerospace Corp.)
Dec. 1982
LAR-12816 **Vol. 6, No. 3, P. 314**
Plastic and Large Deflection Analysis of Nonlinear Structures (PLANS) system is collection of five computer programs for finite-element static-plastic and large deflection analysis of variety of nonlinear structures. System considers bending and membrane stresses, general three-dimensional bodies, and laminated composites.

B81-10324
HIGH-LIFT SEPARATED FLOW ABOUT AIRFOILS
L. A. CARLSON (Texas A & M University)
Dec. 1982
LAR-12853 **Vol. 6, No. 3, P. 315**
TRANSEP Calculates flow field about low-speed single-element airfoil at high-angle-of-attack and high-lift conditions with massive boundary-layer separation. TRANSEP includes effects of weak viscous interactions and can be used for subsonic/transonic airfoil design and analysis. The approach used in TRANSEP is based on direct-inverse method and its ability to use either displacement surface or pressure as airfoil boundary condition.

07 MACHINERY

B81-10076
DYNAMIC ISOLATION FOR CRYOGENIC REFRIGERATORS
R. D. AVERILL and J. CROSSLEY EDWARD A.
Sep. 1982
LAR-12728 **Vol. 6, No. 1, P. 75**
Prototype pressure-compensated mounting isolates a Tunable Diode Laser (TDL) housing from mechanical vibration. Mounting is being tested as part of Langley Research Center program for development of highly sensitive instruments that remotely measure important chemical constituents of atmosphere. Instruments typically have requirement for cryogenic cooling of sensitive detectors and components that are necessary to detect presence of tenuous constituents of atmosphere. Key elements of mounting are two bellows, reaction plate, flexible straps and vibration isolators.

B81-10077
CONSTANT-PRESSURE HYDRAULIC PUMP
C. W. GALLOWAY
Sep. 1982
MSC-18794 **Vol. 6, No. 1, P. 76**
Constant output pressure in gas-driven hydraulic pump would be assured in new design for gas-to-hydraulic power converter. With a force-multiplying ring attached to gas piston, expanding gas would apply constant force on hydraulic piston even though gas pressure drops. As a result, pressure of hydraulic fluid remains steady, and power output of the pump does not vary.

B81-10078
ADHESIVES MIXER APPLICATOR
D. O. RAMOS (General Electric Co.) and K. E. WERNER
Sep. 1982
MSC-18916 **Vol. 6, No. 1, P. 77**
Two-part adhesives are stored, mixed, and dispensed by an applicator originally developed for use aboard the Space Shuttle orbiter. Compressed gas furnishes energy for mixing and dispensing. An operator needs only to open pressure valve and pull a trigger on dispenser nozzle to apply adhesive.

B81-10079
AUTOMATIC COLLECTION OF ROCK AND SOIL SAMPLES
G. M. KYRIAS (Martin Marietta Corp.)
Sep. 1982
MSC-18868 **Vol. 6, No. 1, P. 77**
Proposed machine would sample rock or soil automatically. Mounted on a wheeled or tracked vehicle, machine positions drill for cut at any angle from horizontal to vertical, moves power head to drive drill into cut, and stores drilled core in a container. New concept may also be useful in terrestrial agricultural and geologic surveys.

B81-10080
AERODYNAMICS IMPROVE WIND WHEEL
V. W. RAMSEY (National Research Counsel)
Sep. 1982
MFS-25506 **Vol. 6, No. 1, P. 78**
Modifications based on aerodynamic concepts would raise efficiency of wind-wheel electric-power generator. Changes smooth airflow, to increase power output, without increasing size of wheel. Significant improvements in efficiency anticipated without any increase in size or number of moving parts and without departing from simplicity of original design.

B81-10081
LATHE ATTACHMENT FINISHES INNER SURFACE OF TUBES
A. J. LANCKI
Sep. 1982
MSC-18780 **Vol. 6, No. 1, P. 79**
Extremely smooth finishes are machined on inside surfaces of tubes by new attachment for a lathe. The relatively inexpensive accessory, called a 'microhone,' holds a honing stone against workpiece by rigid tangs instead of springs as in conventional honing tools. Inner rod permits adjustment of microhoning stone, while outer tube supports assembly. Outer tube is held between split blocks on lathe toolpost. Microhoning can be done with either microhone or workpiece moving and other member stationary.

B81-10082
BLIND FASTENER IS EASY TO INSTALL
S. A. PETERSON (Rockwell International Corp.)
Sep. 1982
MSC-18742 **Vol. 6, No. 1, P. 80**

Panels, sheets, doors and other structures could be easily attached to and removed from mating part by proposed new fastener. Fastener is permanently anchored in removable part only. Its protruding end is inserted into a hole in mating part. When wedge pin is screwed tightly closed, segmented collar contracts or expands to release parts or to grip them. Installation has no loose parts, and no rear nut is needed.

B81-10083
RESISTANCE HEATER HELPS STIRLING-ENGINE RESEARCH
F. W. HOEHN (CALTECH)
Sep. 1982
NPO-14928 **Vol. 6, No. 1, P. 81**

Stirling engine heater head consists of 18 double-turn coils of tubing, each of which is tightly wrapped with resistance-heating element, through which working gas flows. Coils form a toroid about periphery of heater-head body. With new resistance heater, total circuit resistance can be selected independently of tube geometry by changing size of wires and/or number of wire wraps around each tube.

B81-10084
BALL-AND-SOCKET JOINT CAN BE DISASSEMBLED
R. S. TOTAH (Rockwell International Corp.)
Sep. 1982
LAR-12770 **Vol. 6, No. 1, P. 82**

Ball-and-socket joint originally developed for construction of large platforms in zero g could be used in such Earth-based temporary structures as scaffolding, camping equipment, tent posts, trade shows and displays. New joint consists of a socket mounted on central hub or union and ball-ended bolt or fitting mounted at end of a column or any structural member. Unit is self-contained, requires no loose hardware and is engaged or disengaged without tools manually, or remotely by a manipulator.

B81-10085
INTEGRATED STRUCTURAL AND CABLE CONNECTOR
R. S. TOTAH (Rockwell International Corp.)
Sep. 1982
LAR-12769 **Vol. 6, No. 1, P. 82**

Ball-and-socket coupling includes fiber-optic cable. Three steps couple two parts of fiber-optic cable: ball is inserted into socket; cone is released in, and cable moves toward plug. Sleeve is pulled to end of its travel and cable and plug are mated. Device is a quick-connect/disconnect coupling that has application in hazardous environments, such as space, undersea and nuclear installations.

B81-10086
DEVICE ACQUIRES, ORIENTS, AND CLAMPS
E. C. PRUETT (Essex Corp.) and K. B. ROBERTSON (Essex Corp.)
Sep. 1982
MFS-25403 **Vol. 6, No. 1, P. 84**

Proposed mechanism secures an object in three stages: initial acquisition, alinement, and clamping. Originally developed to aid Space Shuttle crews in retrieving satellites, concept may also be useful in undersea work or as a machine-tool attachment for quick changes of tools.

B81-10087
ADVANCES IN TURBINE-ENGINE TECHNOLOGY
J. C. FRECHE and M. G. AUTT
Sep. 1982 See Also NASA TM-X-73628(N77-33159/NSP)
LEW-13672 **Vol. 6, No. 1, P. 84**

Status report describes major advances in high-temperature materials, coatings, and turbine-blade coating technology for aircraft turbine engines, which are keys to achieving improved performance.

B81-10201
SIMPLER VARIABLE-SPEED DRIVE FOR FAN OR PUMP
H. D. OBLER
Nov. 1982
GSC-12643 **Vol. 6, No. 2, P. 199**

Static pressure developed by a fan or pump is used directly to control its speed in a new drive unit. System is simpler and more economical than many other speed controllers, although it is less accurate and has a narrower speed range. However, since very accurate control is not usually required for fans and pumps, unit would work well in many applications.

B81-10202
MAGNETIC BEARING CONSUMES LOW POWER
P. A. STUDER
Nov. 1982
GSC-12517 **Vol. 6, No. 2, P. 200**

Energy-efficient linear magnetic bearing maintains a precise small separation between its moving and stationary parts. Originally designed for cryogenic compressors on spacecraft, proposed magnetic bearing offers an alternative to roller or gas bearing in linear motion system. Linear noncontacting bearing operates in environments where lubricants cannot be used.

B81-10203
MAGNETIC BEARING WITH ACTIVE CONTROL
M. GOLDOWSKY (North American Philips Corp.)
Nov. 1982
GSC-12582 **Vol. 6, No. 2, P. 201**

Magnetic shaft bearing employs electromagnets energized by signals related to shaft position and velocity. Electromagnets are arranged in orthogonal pairs. Axial and rotational shaft motions are accomodated, and lateral motions are restrained. Axial motion can also be restrained. Self-regulating bearing includes velocity and position control

B81-10204
SPRING SUPPORT FOR TURBOPUMP ROTOR BEARING
M. L. STRANGELAND (Rockwell International Corp.) and C. T. ELLINGBOE (Rockwell International Corp.)
Nov. 1982
MFS-19624 **Vol. 6, No. 2, P. 202**

Novel bearing support for liquid-oxygen turbopumps protects against impact loads while avoiding a major disadvantage of earlier flexible supports. It allows controlled axial movement necessary for proper operation of pressure-operated pump impeller. While spring-loading rotor to midpoint of the axial movement to avoid impact-load damage to turbopump components. Support is made by machining azimuthal slots in cylindrical portion. Resulting structure permits controlled axial deformations.

B81-10205
'BOTTLE-BRUSH' HEAT EXCHANGER
E. TWARD (CALTECH) and J. R. GATEWOOD (CALTECH)
Nov. 1982
NPO-15479 **Vol. 6, No. 2, P. 202**

Heat exchanger consists of a metal tube with wires extending inward from wall. Conduction of heat along wires improves heat transfer to gas or other filling. Fluid is heated throughout the cross section of tube. Suggested applications are refrigerators, heat engines, thermal instrumentation, and heat switches.

B81-10206
CAM-DESIGN TORQUE WRENCH
P. H. J. SCHICK (Rockwell International Corp.) and S. A. GATTUSO (Rockwell International Corp.)
Nov. 1982
MFS-19586 **Vol 6., No. 2, P. 203**

New Torque wrench for electrical connnectors automatically tightens its grip with increasing torque to insure against slippage. Tool requires only minimal clearance between connector and adjacent structures or components. Wrench is operated with one hand and can be used on connectors of various shapes.

B81-10207
CLAMP RESTRAINS PRESSURE LINE
J. A. ALIBERTI
Nov. 1982
KSC-11205 **Vol. 6, No. 2, P. 204**

Safety restraint protects people and property if a high-pressure fitting fails. As long as pressure line remains attached at the fitting, clamp exerts essentially no force on hose. If fitting fails, force of fluid leaving free end of hose causes the cam on the clamp to compress hose with a positive locking action.

B81-10208
UNIDIRECTIONAL FLEXURAL PIVOT
H. BAHIMAN
Nov. 1982
GSC-12622 **Vol. 6, No. 2, P. 204**

Flexural pivot deflects in only one angular direction (either clockwise or counterclockwise) and has a longer operating life than many previous designs. Pivot consists of two rings interconnected by three flat metal parallelograms welded into grooves or slots in inside diameters of rings. Springs flex to relieve compressive stress imparted by angular rotation.

B81-10209
TECHNIQUE FOR MACHINING GLASS
S. H. RICE
Nov. 1982
GSC-12636 **Vol. 6, No. 2, P. 205**

Process for machining glass with conventional carbide tools requires a small quantity of a lubricant for aluminum applied to area of glass to be machined. A carbide tool is then placed against workpiece with light pressure. Tool is raised periodically to clear work of glass dust and particles. Additional lubricant is applied as it is displaced.

B81-10210
IMPROVED HIGH-TEMPERATURE SEAL
K. E. WOOD (Rockwell International Corp.), P. P. ZEBUS (Rockwell International Corp.), and A. R. OLSON (Rockwell International Corp.)
Nov. 1982
MSC-18790 **Vol. 6, No. 2, P. 206**

High-temperature seals on Space Shuttle Orbiter elevons will be improved by a new flexible seal design that increases the number of leak barriers, allows for thermal expansion and cuts weight by more than two-thirds. Improved seal may be useful in applications where it is necessary to seal gaps between moving surfaces.

B81-10211
COMPACT LIQUID DEAERATOR
S. T. YAMAUCHI (Rockwell International Corp.)
Nov. 1982
MSC-18936 **Vol. 6, No. 2, P. 206**

Gases are removed from liquids by a new deaerator that takes up only 5 inches (12.7 cm) at top of a medium-sized storage tank. Deaerator has a multiple cascading header that exposes more fluid at lower pressures than typical commercial deaerators. Potential applications are in hydraulic systems for aircraft and heavy machinery, in cooling systems where deaerated liquid is needed to prevent cavitation of pump.

B81-10212
TOUCH SENSOR RESPONDS TO CONTACT PRESSURE
A. K. BEJCZY (CALTECH)
Nov. 1982
NPO-15375 **Vol. 6, No. 2, P. 207**

Optical tactile sensor for mechanical hands senses contact pressure via change in light reflected from an elastic covering. Pressure against a cell cover causes distortion, which changes internal reflection of light. Change is sensed by detector, and output signal informs operator of contact. The greater the pressure and distortion, the greater the change in light reflection.

B81-10213
STAGED TURBOJET ENGINE WOULD EMIT LESS NO
R. A. CRAIG and H. O. PRITCHARD (Centre for Research in Experimental Space Science, York University)
Nov. 1982
ARC-10814 **Vol. 6, No. 2, P. 208**

New turbojet-engine concept could reduce nitric oxide emissions to a level from one-fifteenth to as little as one three-hundredth that of conventional units. Multiple-stage combustor could overcome flame instability problems associated with previous low-flame-temperature systems. It operates in a relatively-simple adiabatic mode without elaborate fuel-flow and air circulation patterns.

B81-10214
IMPROVED CABLE GRIP REDUCES WEAR
R. J. PEYRAN
Nov. 1982
ARC-11318 **Vol. 6, No. 2, P. 209**

Improved cable grip reduces wear due to sliding friction between cable and gripping surfaces. Drive wheels are grooved with a helical pattern that meshes with the lay of cable, analogous to a worm gear. Cable is gripped between drive wheels and guide rollers, and cable pull is exerted on the grip when drive wheels are slowed by hydraulic clutches. Cable grip may be applicable to cable-operated systems, such as ore trams in mines, overhead cable cars and ski lifts.

B81-10215
VACUUM HEAD REMOVES SANDING DUST
C. G. BENGLE (Rockwell International Corp.) and J. W. HOLT (Rockwell International Corp.)
Nov. 1982
MSC-19526 **Vol. 6, No. 2, P. 210**

Vacuum sander prevents sanding dust from entering a work area, since dust particles are drawn off as quickly as they are produced. Tool is useful where dust presents health hazards, interferes with such processes as semiconductor manufacture, or could destroy wet paint or varnish finishes. Could be used to sand such materials as lead paint.

B81-10216
TOOL LIFTS AGAINST SURFACE TENSION
P. MILLER (McDonnell Douglas Corp.), S. MCCORMICK (McDonnell Douglas Corp.), E. MUEGGE (McDonnell Douglas Corp.), and P. DEVEREAUX (McDonnell Douglas Corp.)
Nov. 1982
GSC-12672 **Vol. 6, No. 2, P. 210**

Simple tool overcomes surface tension gently but firmly by tightening a bolt in steel angle located on either side of an object mounted on a base plate, such as a battery. As bolts press against protective sheets of metal on the mounting plate, they lift the object, overcoming surface tension of grease on the mounting plate.

B81-10217
FOUR-DEGREE-OF-FREEDOM PLATFORM
R. C. CHOU (Franklin Institute)
Nov. 1982
ARC-11286 **Vol. 6, No. 2, P. 211**

Hydraulic actuators make a new motion control system more compact and more efficient than previous designs that use gimbals. System moves a platform in four degrees of freedom--simultaneous pitch, roll, yaw, and displacement. Developed for flight simulators, kinematic concept may also

be useful in stabilizing platforms for shipboard equipment, material-handling machinery, and construction equipment.

B81-10218
EXPLOSIVE SEPARATION OF ELECTRICAL CONNECTORS
R. T. BARBOUR (Rockwell International Corp.)
Nov. 1982
MSC-18828 **Vol. 6, No. 2, P. 212**
Concept proposed for separating electrical cable that connects the Space Shuttle to deployable payloads could be used to sever electrical connections in other inaccessible environments. Although triggered explosively, connector would not release combustion products that could damage sensitive electronics. Suggested applications are undersea exploration, chemical processing and areas with high levels of radiation.

B81-10219
RELIABLE 'UNLATCH'
T. O. KILLGROVE (CALTECH)
Nov. 1982
NPO-15438 **Vol. 6, No. 2, P. 213**
Reliable unlatching mechanism utilizes preloading, a favorable geometric arrangement of mating surfaces, and redundancy to assure release. Even if only one rocking arm initially releases, the entire assembly will rotate or rock sideways to complete unlatching. Device could be useful in other applications requiring reliable remote disconnection of cables or pipes.

B81-10220
LATCH WITH SINGLE-MOTION RELEASE
D. N. SETZER (Pan American World Airways, Inc.) and S. L. HOOPER (Pan American World Airways, Inc.)
Nov. 1982
MSC-18923 **Vol. 6, No. 2, P. 214**
Quick-load/quick-release mechanism allows an object such as a battery to be inserted with a single motion, locks and latches the object, and allows the object to be released with a single motion.

B81-10325
A SIMPLE TILTMETER
M. G. DIX, D. R. HARRISON, and T. M. EDWARDS
Dec. 1982
ARC-11344 **Vol. 6, No. 3, P. 319**
Bubble vial with external aluminum-foil electrodes is sensing element for simple indicating tiltmeter. To measure bubble displacement, bridge circuit detects difference in capacitance between two sensing electrodes and reference electrode. Tiltmeter was developed for experiment on forecasting seismic events by changes in Earth's magnetic field.

B81-10326
'TEACHING' AN INDUSTRIAL ROBOT TO SPRAY
A. R. EVANS (United Space Boosters Inc.) and G. K. SWEET (United Space Boosters Inc.)
Dec. 1982
MFS-25523 **Vol. 6, No. 3, P. 320**
Teaching device, consisting of spacer rod or tube with three-pointed tip and line level, is used during pattern 'teach-in' to make sure that robot manipulator holds spray gun perpendicular to surface to be sprayed and at right distance from it. For slanted surfaces angle adapter is added between spacer rod and line-level indicator. Angle is determined by slope of surface to be sprayed, thus allowing a perpendicular spray pattern against even slanted surfaces.

B81-10327
HYBRID POSITION/FORCE CONTROL OF ROBOT MANIPULATORS
M. H. RAIBERT (CALTECH) and J. J. CRAIG (CALTECH)
Dec. 1982
NPO-14997 **Vol. 6, No. 3, P. 320**
In proposed method for task-oriented control of robot manipulator, position and force error signals for each task degree of freedom are used to calculate appropriate control parameters in task coordinates. Position and force error signals are transformed and summed to create drive signal for each actuator. New hybrid control technique does not require operator to supply complex transform matrices. Control trajectories are easily visualized in terms of task to be performed.

B81-10328
PRECISE RESTRAIGHTENING OF BENT STUDS
R. E. BOARDMAN (Rockwell International Corp.)
Dec. 1982
MFS-19632 **Vol. 6, No. 3, P. 321**
Special tool quickly bends studs back into shape accurately and safely by force applied by hydraulic ram, with deflection being measured by dial indicator. Ram and indicator can be interchanged for straightening in reverse direction.

B81-10329
UNIVERSAL ASSEMBLY FOR CAPTIVE BOLTS
M. L. MARKE (Rockwell International Corp.) and B. HAGOPIAN (Rockwell International Corp.)
Dec. 1982
MSC-18905 **Vol. 6, No. 3, P. 322**
New method allows for virtually any bolt to be easily converted to 'captive' bolt. Method eliminates need for separate design for each application. Cup-shaped washer that is flattened secures tap to bolt. Wire attached to tab holds bolt assembly captive. Flattening washer can also be done during installation of bolt. Wash, tab and spacer are all made of corrosion-resistant steel.

B81-10330
ARTICULATED VACUUM CHUCK
S. A. PETERSON (Rockwell International Corp.)
Dec. 1982
MSC-18933 **Vol. 6, No. 3, P. 323**
Vacuum chuck conforms to complex surface contours. Gripping surface is polyurethane panel embedded with links of roller chain. Panel flexes under vacuum to adjust to surface contour, and then bolts are tightened to lock configuration. Possible applications of new chuck are in pull-testing contoured surfaces, holding assemblies together for repairs, or for handling unusually-shaped parts.

B81-10331
FLYWHEELS WOULD COMPENSATE FOR ROTOR IMBALANCE
J. A. S. HRASTAR
Dec. 1982
GSC-12550 **Vol. 6, No. 3, P. 323**
Spinning flywheels within rotor can null imbalance forces in rotor. Flywheels axes are perpendicular to each other and to rotor axis. Feedback signals from accelerometers or strain gages in platform control flywheel speeds and rotation directions. Concept should be useful for compensating rotating bodies on Earth. For example, may be applied to large industrial centrifuge, particularly if balance changes during operation.

B81-10332
HIGH-SPEED WAFER SLICER
F. SCHMID (Crystal Systems, Inc.), C. P. KHATTAK (Crystal Systems, Inc.), and M. B. SMITH (Crystal Systems, Inc.)
Dec. 1982
NPO-15463 **Vol. 6, No. 3, P. 324**
Multiblade cutter slices silicon ingots into solar-cell wafers quickly and with little waste. Speed and blade pressure ensure high wafer-production rate. Lightweight, balanced construction minimizes blade vibration and reduces sideways motion that would otherwise widen kerf and waste silicon.

B81-10333
BRUSHLESS CLEANING OF SOLAR PANELS AND WINDOWS
H. W. SCHNEIDER (CALTECH)
Dec. 1982
NPO-14922 **Vol. 6, No. 3, P. 325**

Machine proposed for cleaning solar panels and reflectors uses multiple vortexes of air, solvent, and water to remove dust and dirt. Uses no brushes that might abrade solar surfaces and thereby reduce efficiency. Machine can be readily automated and can be used on curved surfaces such as aparbolic reflectors as well as on flat ones. Cleaning fluids are recycled, so that large quantities of water and solvent are not needed.

B81-10334
SAFETY BOLT DOUBLES AS A BUSHING-REMOVAL TOOL
C. E. HAVERKAMP (McDonnell Douglas Corp.)
Dec. 1982
MSC-20032 **Vol. 6, No. 3, P. 326**

Bushings fitted to close tolerances and limited access can be removed without damage to housing by using bolt with integrated locking dog. Such self-retaining positive - locking bolts are normally used as fasteners in critical joints where accidentally loosened bolt could cause damage or injuries.

B81-10335
IMPROVED NOZZLE WOULD REDUCE CRYOGENIC BOILOFF
E. D. SIMON (Martin Marietta Corp.) and W. E. SIMON (Martin Marietta Corp.)
Dec. 1982
MFS-25589 **Vol. 6, No. 3, P. 327**

Improved nozzle has slotted orifice that would impart swirling motion to cryogenic liquid inside cylinder. Nozzle is installed with axis vertical. Since most of flow out of cylinder would be radial, fluid spray would not reach liquid surface.

B81-10336
STAKING TOOL FOR HARD METALS
J. A. STEIN (Rockwell International Corp.)
Dec. 1982
MSC-20009 **Vol. 6, No. 3, P. 328**

Simple tool stakes hard-steel parts--that is, forces one part into recess on another, deforming receiving part so that it restrains inserted one. Tool allows small machine shops to stake hard steel without massive presses. Can be used, for example, to insert ball and spring into hard steel snap-tool body such as that used to turn socket wrenches. Use is not limited to hard steel; can be used as well to assemble parts made of softer materials.

B81-10337
FORCE AUGMENTATION FOR RELIEF VALVE
J. LUGER (Parker Hannifin Corp.)
Dec. 1982
MSC-20065 **Vol. 6, No. 3, P. 329**

Simple design change for poppet relief valve enables flow through valve to exert additional force to help keep valve open. Although originally intended for relief valves for liquid oxygen and liquid nitrogen in Space Shuttle orbiter, concept is applicable to pressure-or flow-actuated valves for wide range of fluids and temperatures.

B81-10338
DAMPING VIBRATION AT AN IMPELLER
J. A. HAGER (Rockwell International Corp.) and B. F. ROWAN (Rockwell International Corp.)
Dec. 1982
MFS-19645 **Vol. 6, No. 3, P. 329**

Vibration of pump shaft is damped at impeller--where vibration-induced deflections are greatest--by shroud and seal. Damping reduces vibrational motion of shaft at bearings and load shaft places on them. Flow through clearance channel absorbs vibration energy.

B81-10339
TESTS OF 38 BALL-BEARING GREASES
E. L. MCMURTREY
Dec. 1982
MFS-25624 **Vol. 6, No. 3, P. 330**

Report presents interim results in program of long-term tests of ball-bearing greases in vacuum, oxidizing, and otherwise hostile environment. Program is motivated by need for mechanisms that will operate for long periods in spacecraft or space stations. Class of lubricants based on perfluoroalkylpolyether (PFPE) with fluorotelomer thickeners has given best results in vacuum tests completed thus far. Test methods and performances of various lubricants could be of interest in automotive and industrial communities.

08 FABRICATION TECHNOLOGY

B81-10088
IMPROVED CLOTHING FOR FIREFIGHTERS
F. J. ABELES (Grumman Aerospace Corp.)
Sep. 1982 See also NASA CR-161529(N80-32098/NSP); NASA CR-161530(N80-32586/NSP); NASA CR-161531 (N80-32100/NSP);NASA CR-161532(N80-32099/NSP)
MFS-25546 **Vol. 6, No. 1, P. 87**

Application of space technology should reduce incidence of injuries, heat exhaustion, and fatigue in firefighters. Using advanced materials and design concepts of aerospace technology, protective gear was fabricated and tested for the heat, face, torso, hand and foot. In tests, it was found that new gear protects better than conventional firefighter gear, weighs 40 percent less, and reduces wearer's energy expenditure by 25 percent.

B81-10089
GRAVITY-FEED GROWTH OF SILICON RIBBON
G. W. CULLEN (RCA Corp.)
Sep. 1982
NPO-14967 **Vol. 6, No. 1, P. 88**

In inverted Stepanov apparatus, silicon is melted in vee-shaped crucible that has long narrow slot at bottom of vee. Molten silicon flows from slot at a rate controlled by fluid pressure. As it emerges, it cools and solidifies to form a continuous ribbon. To eliminate surface-tension effects, crucible walls are made of a material that liquid silicon does not wet.

B81-10090
HEAT-EXCHANGER METHOD OF CRYSTAL GROWTH
C. P. KHATTAK (Crystal Systems, Inc.) and F. SCHMID (Crystal Systems, Inc.)
Sep. 1982
NPO-14819 **Vol. 6, No. 1, P. 89**

Large crystals of silicon are grown from melt, in either vacuum or pressurized atmosphere, without moving crucible, furnace, or anything else. Seed crystal is mounted on helium-cooled heat exchanger, which prevents seed from melting when furnace melts rest of silicon material in crucible; heat exchanger draws off heat from melt so that a solid ingot grows outward from seed in a regular crystal structure. Bottom of crucible is insulated so that heat exchanger cools only seed.

B81-10091
REMOVING DEFECTS FROM SILICON RIBBON
K. SHIMADA (CALTECH)

Sep. 1982
NPO-14772 **Vol. 6, No. 1, P. 89**

Proposal for removing impurities from silicon ribbon and sheet could be developed into an automated production-line process. New technique which combines ion-cluster bombardment, electron-gun heating, and plasma etching, could be key step in fabricating inexpensive solar-cell arrays. Silicon sheets and ribbons treated this way could have enhanced carrier lifetimes necessary for satisfactory solar-cell performance.

B81-10092
CERAMIC FOR SILICON-SHAPING DIES
I. SEKERCIOGLU (Battelle Memorial Inst.) and R. R. WILLS (Battelle Memorial Inst.)
Sep. 1982
NPO-14783 **Vol. 6, No. 1, P. 90**

Silicon beryllium oxynitride (SiBON) is a promising candidate material for manufacture of shaping dies used in fabricating ribbons or sheets of silicon. It is extremely stable, resists thermal shock, and has excellent resistance to molten silicon. SiBON is a solid solution of beryllium silicate in beta-silicon nitride.

B81-10093
RECHARGING THE SILICON CRUCIBLE IN A HOT FURNACE
R. L. LANE (Kayex Corp.)
Sep. 1982
NPO-14980 **Vol. 6, No. 1, P. 91**

'Melt recharger' adds raw silicon to crucible in crystal-growing furnace without disturbing inert-gas atmosphere or significantly lowering temperature of melt. Crucible-refill hopper is lowered into hot zone of crystal-pulling chamber through an isolation valve. Cable that supports hopper is fastened to cone-shaped stopper in bottom of hopper. Stopper moves out of opening in hopper, allowing part of polysilicon charge to drop into crucible.

B81-10094
CRUCIBLE GROWS WIDE SILICON RIBBON
R. SEIDENSTICKER (Westinghouse Electric Corp.)
Sep. 1982
NPO-14859 **Vol. 6, No. 1, P. 91**

Inexpensive manufacture of solar cells may require quality silicon ribbon crystals. One way to produce them is by growing wide dendritic webs, which can be very long and have high structural perfection. Dendrites grow from supercooled melt, so width of ribbon depends on how wide a region of supercooled molten silicon can be maintained in crucible. Elongated geometry of suscepter/crucible/lid assembly allows molten silicon to supercool over a wider region -- a necessary condition for the growth of wide dendritic crystal ribbon.

B81-10095
REFRACTORIES KEEP SILICON CRYSTALS PURE
F. SCHMID (Crystal Systems, Inc.) and C. P. KHATTAK (Crystal Systems, Inc.)
Sep. 1982
NPO-14820 **Vol. 6, No. 1, P. 92**

Formation of carbon monoxide gas is prevented by a linear of refractory material free of elemental carbon. For pressures above about 4 torr, silicon carbide can be used as refractory liner. The problem of carbide contamination can arise in crystal growth of any material that forms a carbide more stable than carbon monoxide. Prevention in such cases is possible by using noncarbon refractories in place of graphite.

B81-10096
IMPROVED FACILITY FOR PRODUCING SILICON WEB
C. S. DUNCAN (Westinghouse Electric Corp.)
Sep. 1982
NPO-14860 **Vol. 6, No. 1, P. 93**

Growth of continuous silicon dendritic web that is up to 5 cm wide instead on only 1.3 cm is formed by freezing of supercooled liquid silicon between two needlelike dendritic crystals. Growth takes place in a work chamber filled with argon gas. As web grows, it is drawn out of chamber through a duct and guided to a storage reel.

B81-10097
AUTOMATIC CONTROL OF SILICON MELT LEVEL
C. S. DUNCAN (Westinghouse Electric Corp.) and W. B. STICKEL (Westinghouse Electric Corp.)
Sep. 1982
NPO-15487 **Vol. 6, No. 1, P. 94**

A new circuit, when combined with melt-replenishment system and melt level sensor, offers continuous closed-loop automatic control of melt-level during web growth. Installed on silicon-web furnace, circuit controls melt-level to within 0.1 mm for as long as 8 hours. Circuit affords greater area growth rate and higher web quality, automatic melt-level control also allows semiautomatic growth of web over long periods which can greatly reduce costs.

B81-10098
TEMPERATURE-CONTROLLED SUPPORT FOR A SEED CRYSTAL
J. L. REEVE (TRW, Inc.)
Sep. 1982
MFS-25341 **Vol. 6, No. 1, P. 94**

A rodlike structure called a sting has been proposed for supporting a seed crystal at center of a body of saturated fluid and for controlling temperature/time profile of seed for experiments on crystal growth. Seed crystal is cooled or heated by thermoelectric modules while surrounding sheath remains at solution temperature. Heat is withdrawn to cooling fins by heat pipe, which replaces solid copper rod in a previous design.

B81-10099
FIBER-REINFORCED SLIP CASTINGS
J. C. BLOME, D. N. DRENNAN (McDonnel Douglas Corp.), and H. M. KEESER (McDonnel Douglas Corp.)
Sep. 1982
ARC-11279 **Vol. 6, No. 1, P. 95**

Addition of silica fibers greatly reduces shrinkage and cracking during casting of ceramics. Fiber-reinforced slip-cast silica ceramics are also tougher and have lower dielectric loss. Silica fibers are hyperpure material containing only 1 part per million total metal-ion impurities. Hyperpure fibers ensure high reflectance and allow casting to be fired at temperature greater than 2,200 degrees F without loss of strength from devitrification.

B81-10100
FLUXLESS BRAZING OF LARGE STRUCTURAL PANELS
C. S. BEUYUKIAN (Rockwell International Corp.)
Sep. 1982 See Also NASA CR-3159(N79-31628/NSP)
LAR-12519 **Vol. 6, No. 1, P. 96**

Fluxless brazing is used in fabricating aluminum structural panels that withstand high internal pressure. Aluminum sheet of structural thickness with 4045 aluminum/silicon-braze-alloy cladding is brazed to corrugated 'fin stock' having channels 0.001 inch (0.03mm) high by same width. Process is carried out in an inert (argon) atmosphere in a retort furnace. Filler bars are used in some channels to prevent fin stock from collapsing as pressure is applied.

B81-10101
WEATHERPROOF CRIMP CONNECTOR
F. J. MOSNA (Motorola, Inc.)
Sep. 1982
NPO-15497 **Vol. 6, No. 1, P. 97**

Concept for electrical connector combines environmental durability of a sealed connection with simplicity and economy of a crimped connection. Device should provide convenient and reliable outdoor electrical connections. Environmental durability and crimpability are ensured by

elastomer tube and metal barrel. An external metal sheath protects elastomer from damage during crimping.

B81-10102
CAPACITIVELY-HEATED FLUIDIZED BED
E. J. MCHALE (Union Carbide Corp.)
Sep. 1982
NPO-14912 **Vol. 6, No. 1, P. 98**
Fluidized-bed chamber in which particles in bed are capacitively heated produces high yields of polycrystalline silicon for semiconductor devices. Deposition of unrecoverable silicon on chamber wall is reduced, and amount of recoverable silicon depositing on seed particles in bed is increased. Particles also have a size and density suitable for direct handling without consolidation, unlike silicon dust produced in heated-wall chambers.

B81-10103
SHAPING TRANSISTOR LEADS FOR BETTER SOLDER JOINTS
H. MANDEL (TRW, Inc.) and J. D. DILLON (TRW, Inc.)
Sep. 1982
MSC-18837 **Vol. 6, No. 1, P. 99**
Special lead-forming tool puts step in leads of microwave power transistors without damaging braze joints that fasten leads to package. Stepped leads are soldered to circuit boards more reliably than straight leads, and stress on brazes is relieved. Lead-forming hand-tool has two parts: a forming die and an actuator. Spring-loaded saddle is adjusted so that when transistor package is placed on it, leads rest on forming rails.

B81-10104
METALLIC PANELS WOULD INSULATE AT 2,700 DEGREES F
R. L. JACKSON
Sep. 1982
LAR-12620 **Vol. 6, No. 1, P. 100**
Multiwall metallic panels now under development as replacements for ceramic surface-insulation tiles of Space Shuttle could eventually be used in other aircraft, possibly even as thermal protection in ground-based applications. Various configurations of basic multilayer sandwich are expected to protect against temperatures ranging from 700 degrees to 2,700 degrees F (370 degrees -1, 480 degrees C). With assistance from heat-pipe cooling, panels should withstand temperature to 3,500 degrees F (1,930 degrees C); however, heat pipes would not exceed 1,600 degrees F (870 degrees C).

B81-10105
WIRE EDM FOR REFRACTORY MATERIALS
G. R. ZELLARS, F. E. HARRIS, C. E. LOWELL, W. M. POLLMAN, V. J. RYS, and R. J. WILLS
Sep. 1982
LEW-13460 **Vol. 6, No. 1, P. 101**
In an attempt to reduce fabrication time and costs, Wire Electrical Discharge Machine (Wire EDM) method was investigated as tool for fabricating matched blade roots and disk slots. Eight high-strength nickel-base superalloys were used. Computer-controlled Wire EDM technique provided high quality surfaces with excellent dimensional tolerances. Wire EDM method offers potential for substantial reductions in fabrication costs for 'hard to machine' alloys and electrically conductive materials in specific high-precision applications.

B81-10106
HEAT LAMPS SOLDER SOLAR ARRAY QUICKLY
P. J. COYLE (RCA Corp.) and M. S. CROUTHAMEL (RCA Corp.)
Sep. 1982
NPO-14866 **Vol. 6, No. 1, P. 101**
Interconnection tabs in a nine-solar-cell array have been soldered simultaneously with radiant heat. Cells and tabs are held in position for soldering by sandwiching them between compliant silicone-rubber vacuum platen and transparent polyimide sealing membrane. Heat lamps warm cells, producing smooth, flat solder joints of high quality.

B81-10107
HIGH-TEMPERATURE SEAL FOR SLIDING-GATE VALVE
R. G. LEONARD (Rockwell International Corp.)
Sep. 1982
MFS-19607 **Vol. 6, No. 1, P. 102**
Sliding-gate valve originally developed for rocket exhaust-gas ducts is sealed by a Belleville spring. It is simple, compact, and operates over a wider range of temperatures than conventional O-ring sealed valves.

B81-10108
STRUCTURAL MODULES WOULD CONTAIN TRANSMISSION LINES
W. A. LEAVY
Sep. 1982
GSC-12523 **Vol. 6, No. 1, P. 103**
New proposal, originally suggested for Spacecraft, is a set of uniformly sized mass-producible modular structural elements that contain electric, fluid, and other transmission lines. Since lines are encapsulated, they are less likely to be damaged. Module shell could be solid metal, sheet metal, honeycomb, fiberglass, plastic, composites, or wood.

B81-10109
IC CAPACITORS ON GROUPS III-TO-V SUBSTRATES
G. E. ALCORN and R. JONES
Sep. 1982
GSC-12543 **Vol. 6, No. 1, P. 104**
Oxides applied by a 'spin-on' process have been used to fabricate capacitors on gallium arsenide and indium phosphide substrates: they might also be used with other compounds of elements in groups III to V of the periodic table. The III-to-V materials are attractive for integrated circuits because they offer responses potentially six times faster than silicon.

B81-10210
LEVITATOR FOR CONTAINERLESS PROCESSING
L. H. BERG, W. A. ORAN, and J. M. THEISS
Sep. 1982
MFS-25509 **Vol. 6, No. 1, P. 105**
Objects are levitated by aerodynamic forces in an apparatus originally developed for space research but just as effective on Earth. New levitator is orientation-independent. Also works equally as well whether or not gravity is present. Apparatus supports a sphere by aerodynamic forces from gas flowing through convergent/divergent section. Concentric inner tube is moved along axis of cylindrical housing.

B81-10111
SPRAYED COATING RENEWS BUTYL RUBBER
R. B. MARTIN (Boeing Service International, Inc.)
Sep. 1982
KSC-11198 **Vol. 6, No. 1, P. 106**
Damaged butyl rubber products are renewed by spray technique originally developed for protective suits worn by NASA workers. A commercial two-part adhesive is mixed with Freon-113 (or equivalent) trichlorotrifluoroethane to obtain optimum viscosity for spraying. Mix is applied with an external-air-mix spray gun.

B81-10112
METAL SANDWITH PANEL WITH BIAXIALLY CORRUGATED CORE
W. L. KO
Sep. 1982
FRC-11026 **Vol. 6, No. 1, P. 106**
Biaxially-corrugated sandwich core, formed by concurrent diffusion bonding and superplastic deformation, makes a proposed sandwich panel unusually strong and stiff. New panel should be useful where light-weight panel that

resists bending is needed. Panel would have internal core consisting of multitude of hollow, truncated pyramids. Four layers of panel would be diffusion-binded at all contacting areas.

B81-10113
ULTRA-THIN-FILM GAAS SOLAR CELLS
K. L. WANG (CALTECH), B. K. SHIN (CALTECH), Y. C. M. YEH (CALTECH), and R. J. STIRN (CALTECH)
Sep. 1982
NPO-14930 **Vol. 6, No. 1, P. 108**

Process based on organo-metallic chemical vapor deposition (OM/CVD) of trimethyl gallium with arsine forms economical ultrathin GaAs epitaxial films. Process has higher potential for low manufacturing cost and large-scale production compared with more-conventional halide CVD and liquid-phase epitaxy processes. By reducing thickness of GaAs and substituting low-cost substrate for single-crystal GaAs wafer, process would make GaAs solar cells commercially more attractive.

B81-10114
SEALED STRIP LINE FOR EXTREME TEMPERATURES
G. C. SARGENT (Watkins Johnson Co.)
Sep. 1982
MSC-16994 **Vol. 6, No. 1, P. 108**

Enclosed strip-line feed for microwave antennas is made by plating exterior of an assembly of etched copper-clad dielectric boards. New circuit consists of inner conductor, dielectric, and outer conductor, in a structure similar to a coaxial transmission line. New strip line could be used in airborne-radar front ends and feed networks; adaptable for underwater applications.

B81-10115
WIRE WHIP KEEPS SPRAY NOZZLE CLEAN
H. R. CARROLL (Martin Marietta Corp.)
Sep. 1982
MFS-25175 **Vol. 6, No. 1, P. 109**

Air-turbine-driven wire whip is clamped near spray-gun mount. When spray gun is installed, wire whip is in position to remove foam buildup from nozzle face. Two lengths of wire 1 to 2 inches long and about 0.03 inch in thickness are used. Foam spray would be prevented from accumulating on nozzle face by increasing purge flow and cutting vortex-generating grooves inside cap and on nozzle flats.

B81-10116
MATERIALS PROCESSING IN SPACE
R. J. NAUMANN
Sep. 1982 See Also NASA TM-78294(N80-31418/NSP)
MFS-25544 **Vol. 6, No. 1, P. 110**

A report describes investigations of materials processing in low-gravity environment. Ultimately, research could lead to new commercially-applicable materials and processes and to an understanding of constraints imposed by gravity. NASA-supported work is carried out in 46 academic, industrial, and Government laboratories, and covers a number of areas. An overview is given of objective and current state of development for over 100 tasks.

B81-10221
SOUND WAVES LEVITATE SUBSTRATES
M. C. LEE (CALTECH) and T. G. WANG (CALTECH)
Nov. 1982
NPO-15435 **Vol. 6, No. 2, P. 217**

System recently tested uses acoustic waves to levitate liquid drops, millimeter-sized glass microballoons, and other objects for coating by vapor deposition or capillary attraction. Cylindrical contactless coating/handling facility employs a cylindrical acoustic focusing radiator and a tapered reflector to generate a specially-shaped standing wave pattern. Article to be processed is captured by the acoustic force field under the reflector and moves as reflector is moved to different work stations.

B81-10222
PROTECTIVE GARMENT ENSEMBLE
M. E. WAKEFIELD (Martin Marietta Aerospace)
Nov. 1982
KSC-11203 **Vol. 6, No. 2, P. 218**

Protective garment ensemble with internally-mounted environmental- control unit contains its own air supply. Alternatively, a remote-environmental control unit or an air line is attached at the umbilical quick disconnect. Unit uses liquid air that is vaporized to provide both breathing air and cooling. Totally enclosed garment protects against toxic substances.

B81-10223
THERMALLY INSULATED GLOVE WITH GOOD TACTILITY
R. BALINSKAS (United Technologies Corp.)
Nov. 1982
MSC-18926 **Vol. 6, No. 2, P. 219**

Thermally insulated glove contains short, closely-spaced elastomeric pins that insulate without impairing flexibility. By confining pins to the inter-joint areas of palm, fingers and back of the hand, joint mobility is retained. Glove thermal-insulation requirements dictate the relationships among pin length, pin diameter, and number of pins per unit surface length.

B81-10224
LIGHTWEIGHT FACE MASK
W. E. I. CASON, R. M. BAUCOM, and R. C. EVANS
Nov. 1982
LAR-12803 **Vol. 6, No. 2, P. 220**

Lightweight face mask originally developed to protect epileptic patients during seizures could have many other medical and nonmedical applications such as muscular distrophy patients, football linesmen and riot-control police. Masks are extremely lightweight, the lightest of the configurations weighing only 136 grams.

B81-10225
CONTAMINATION CONTROL DURING WELD REPAIRS
M. L. CASSIDENTI (Rockwell International Corp.) and R. K. BURLEY (Rockwell International Corp.)
Nov. 1982
MFS-19652 **Vol. 6, No. 2, P. 220**

Using internal pressure, weld defects in pipes or tanks are repaired without contaminating interiors that cannot be protected or recleaned. Procedure can be used with pipes or tubing that is attached to components with critical internal clearances. Method has also been successfully used to cut completely through a pipe with a handsaw.

B81-10226
TECHNIQUE LOWERS WELD POWER REQUIREMENTS
R. PESSIN (Rockwell International Corp.)
Nov. 1982
MFS-19655 **Vol. 6, No. 2, P. 221**

Three electron-beam welds and a spacer are used to replace a single deep electron-beam weld. Technique would reduce power required for welding making it possible to use low-power sources.

B81-10227
WELD-WIRE MONITOR
R. OLSON (Rockwell International Corp.) and R. HALL (Rockwell International Corp.)
Nov. 1982
MFS-19603 **Vol. 6, No. 2, P. 221**

Changes in the size or composition of weld wire being fed to an automatic welding machine are detected by an impedance-monitoring instrument. The instrument triggers an alarm if the changes would affect weld quality or cause weld failure. Device could find applications in construction of pipelines or nuclear powerplants.

B81-10228
EDDY-CURRENT METER WOULD CHECK WELD WIRE ONLINE
G. R. BAILEY (General Dynamics Corp.)
Nov. 1982
MSC-18891 **Vol. 6, No. 2, P. 222**

Simple Technique samples an entire spool of welding wire to test for contamination or unauthorized filler wire. Since unit monitors entire length of wire used in welding, completed welds need not be inspected individually. Technique would save time, avoiding human interface and production delays.

B81-10229
'RUGGEDIZED' MICROCOMPUTER BUS
T. J. BUDNEY and R. W. J. STONE
Nov. 1982
GSC-12691 **Vol. 6, No. 2, P. 222**

'Ruggedized' version of the STD microcomputer bus withstands rigors of space-flight. Could be used as a basis for microcomputers in other hazardous environments, including those at high and low temperatures, those in vacuum, or those subject to extreme shock and vibration.

B81-10230
BORON/ALUMINUM-TITANIUM HAT-SECTION STIFFENER
C. R. MAIKISH (General Dynamics Corp.) and R. R. ECKBERG (General Dynamics Corp.)
Nov. 1982
MSC-18895 **Vol. 6, No. 2, P. 223**

B/Ai-Ti hat-section stiffener is formed from laminated boron/ aluminum and titanium foils. Double layers of titanium at end of a section offer additional strength and protection. Advanced composite structural element combines stiffness, light weight and durability.

B81-10231
PROLONGING THE LIFE OF REFRACTORY FILLERS
C. SCHOMBURG and R. L. DOTTS
Nov. 1982
MSC-18832 **Vol. 6, No. 2, P. 223**

Useful life of a refractory glass cloth gap filler is increased by coating it with a suspension of silicon carbide in butanol and polyethylene. Coating is applied to the refractory filler that seals gaps between insulating tiles on the Space Shuttle orbiter. Silicon carbide coating prevents embrittlement at high temperatures such as those encountered on reentry into Earth's atmosphere.

B81-10232
NEW METHOD FOR JOINING STAINLESS STEEL TO TITANIUM
W. H. EMANUEL (McDonnell Douglas Corp.)
Nov. 1982
MSC-18820 **Vol. 6, No. 2, P. 224**

In new process, edge of stainless-steel sheet is perforated, and joined to titanium by resistance seam welding. Titanium flows into perforations, forming a strong interlocking joint. Process creates a quasi-metallurgical bond between the thin sheets of stainless steel and titanium.

B81-10233
ORIENTATION INSENSITIVITY FOR ELECTROCHEMICAL SENSOR
R. B. CROMER (Becton-Dickinson and Co.)
Nov. 1982
KSC-11176 **Vol. 6, No. 2, P. 224**

Using a wettable polypropylene wick, performance of an electro-chemical hydrazine sensor is made independent of its orientation. Wick keeps all electrodes in constant contact with electrolyte solution so that one or more of the electrodes do not become isolated from the electrolyte if the sensor is tilted or vibrated.

B81-10234
IMPROVED AIR-TREATMENT CANISTER
A. M. BOEHM (United Technologies Corp.)
Nov. 1982
MSC-18942 **Vol. 6, No. 2, P. 225**

Proposed air-treatment canister integrates a heater-in-tube water evaporator into canister header. Improved design prevents water from condensing and contaminating chemicals that regenerate the air. Heater is evenly spiraled about the inlet header on the canister. Evaporator is brazed to the header.

B81-10235
EASILY ASSEMBLED REFLECTOR FOR SOLAR CONCENTRATORS
F. L. BOUQUET (CALTECH) and T. HASEGAWA (CALTECH)
Nov. 1982
NPO-15518 **Vol. 6, No. 2, P. 226**

Reflectors for concentrating solar collectors are assembled quickly and inexpensively by method that employs precontoured supports, plastic film, and adhesive to form a segmented glass mirror. New method is self-focusing, and does not require skilled labor at any stage. Contoured ribs support film and mirror segments of reflector. Nine mirror segments are bonded to sheet. Combined mirror surface closely approximates a spherical surface with a radius of curvature of 36 inches (0.91 m).

B81-10236
INTEGRATED SOLID-ELECTROLYTE CONSTRUCTION
R. RICHTER (CALTECH)
Nov. 1982
NPO-15471 **Vol. 6, No. 2, P. 227**

Proposed construction method for electrolytic cells would integrate porous surface electrodes into a block of solid electrolyte. Porous electrodes would facilitate unrestricted gas flow thereby improving cell performance. Electrode wire mesh is embedded at surface of solid electrolyte. Construction would assure high electrode conductance and low resistance to gas flow.

B81-10237
ASSEMBLING MULTICOLOR PRINTING PLATES
W. J. WATERS
Nov. 1982
LEW-13598 **Vol. 6, No. 2, P. 227**

Improved joining method uses wave-soldering techniques developed for integrated-circuit-board assemblies. Thermosetting plastic is replaced by wave soldering, which applies a thin even coat of solder to mating copper surfaces. This is done after ink holes and channels have been protected by water-soluble, high-temperature solder mask which prevents wetting and clogging.

B81-10238
SELECTIVE ETCHING OF SEMICONDUCTOR GLASSIVATION
N. CASPER (Sperry Corp.)
Nov. 1982
GSC-12667 **Vol. 6, No. 2, P. 228**

Selective etching technique removes portions of glassivation on a semi-conductor die for failure analysis or repairs. A periodontal needle attached to a plastic syringe is moved by a microprobe. Syringe is filled with a glass etch. A drop of hexane and vacuum pump oil is placed on microcircuit die and hexane is allowed to evaporate leaving a thin film of oil. Microprobe brings needle into contact with area of die to be etched.

B81-10239
INDIUM SECOND-SURFACE MIRRORS
F. L. BOUQUET (CALTECH) and T. HASEGAWA (CALTECH)
Nov. 1982
NPO-15085 **Vol. 6, No. 2, P. 228**

Second-surface mirrors are formed by vapor deposition of indium onto glass. Mirrors have reflectances comparable to those of ordinary silver or aluminized mirrors and are expected to show superior corrosion resistance. Mirrors may be used in solar concentrators.

B81-10240
MATCHING DISSIMILAR GRAPHICAL SCALES
R. H. FRENCH (Magnavox Co.)
Nov. 1982
MSC-14864 **Vol. 6, No. 2, P. 229**
Projection of one drawing on another with projected image adjusted to have same scale as other drawing permits quick comparisons of such features as relative sizes of parts and clearance or interferences in assemblies. Technique uses standard overhead projector and transparency of one drawing to project an enlarged image, the scale of which matches scale of second drawings. Image may be traced directly onto copy of second drawing.

B81-10241
DISH ANTENNA WOULD DEPLOY FROM A CANISTER
L. A. FINLEY (Astro Research Corp.) and J. A. HEDGEPETH (Astro Research Corp.)
Nov. 1982
NPO-15448 **Vol. 6, No. 2, P. 229**
37-tile portable microwave antenna is composed of hexagonal tiles supported by a truss. Skewed connecting struts are hinged at their ends, and rotated during storage and deployment. Proposed microwave antenna would be stored compactly in a canister and deployed onsite.

B81-10242
AIR BAG APPLIES UNIFORM BONDING PRESSURE
C. A. GILLESPIE (Rockwell International Corp.)
Nov. 1982
KSC-11182 **Vol. 6, No. 2, P. 231**
Air-bag box applies constant uniform pressure to tiles and other objects undergoing adhesive bonding. Box is basically a compliant clamp with adjustable force and position. Can be used on irregular surfaces as well as on flat ones. Pressurized air is fed to bag through a tube so that it expands, filling the box and pressing against work. Bag adopts a contour that accommodates surface under open side of box.

B81-10243
GLASSES FOR SOLAR-CELL ARRAYS
F. L. BOUQUET (CALTECH)
Nov. 1982
NPO-15528 **Vol. 6, No. 2, P. 231**
Report presents data on glass for encapsulation of solar-cell arrays, with special emphasis on materials and processes for automated high-volume production of low-cost arrays. Commercial suppliers of glass are listed. Factors that affect the cost of glass are examined: type (sheet, float, or plate), formulation, and energy consumed in manufacturing.

B81-10244
CADAT PRINTED-WIRING-BOARD DESIGNER
C. D. BRINKERHOFF (M & S Computing, Inc.)
Nov. 1982
MFS-25464 **Vol. 6, No. 2, P. 232**
CADAT printed-wiring-board system (PWB) designs printed-circuit and hybrid-circuit boards. It is comprised of four programs: preprocessor, placement program, organizer program, and the router. Component placement and interconnection paths are optimized.

B81-10245
COMPOSITE-MATERIAL POINT-STRESS ANALYSIS
F. SPEARS, S. (Rockwell International Corp.)
Nov. 1982
MSC-18978 **Vol. 6, No. 2, P. 232**
PSANAL computes composite-laminate elastic and thermal properties and allowable load levels for any combination of applied membrane and bending loads occurring at a point. Basic linear orthotropic stress/ strain relationships and standard composite-laminate theory formulas are utilized.

B81-10340
AUTOMATED SOLAR-ARRAY ASSEMBLY
A. SOFFA (Kulicke & Soffa Industries, Inc.) and M. BYCER (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15501 **Vol. 6, No. 3, P. 333**
Large arrays are rapidly assembled from individual solar cells by automated production line developed for NASA's Jet Propulsion Laboratory. Apparatus positions cells within array, attaches interconnection tabs, applies solder flux, and solders interconnections. Cells are placed in either straight or staggered configurations and may be connected either in series or in parallel. Are attached at rate of one every 5 seconds.

B81-10341
WALKING-BEAM SOLAR-CELL CONVEYOR
H. FEDER (Kulicke & Soffa Industries, Inc.) and W. FRASCH (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15503 **Vol. 6, No. 3, P. 334**
Microprocessor-controlled walking-beam conveyor moves cells between work stations in automated assembly line. Conveyor has arm at each work station. In unison arms pick up all solar cells and advance them one station: then beam retracks to be in position for next step. Microprocessor sets beam stroke, speed and position.

B81-10342
VACUUM PICKUP FOR SOLAR CELLS
W. FRASCH (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15500 **Vol. 6, No. 3, P. 334**
Flexible vacuum cups that handle solar cells conform to shape or cell back surfaces. Cups lift vertically, without tilt that might cause stress on interconnections, inaccurate placement, or damage to cells. Vacuum source is venturi valve mounted on air manifold.

B81-10343
ORIENTING AND APPLYING FLUX TO SOLAR CELLS
H. FEDER (Kulicke & Soffa Industries, Inc.) and W. FRASCH (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15504 **Vol. 6, No. 3, P. 335**
Solar cells are oriented and fluxed automatically at first work station along solar-array assembly line. In under 2 seconds rotary drive rotates cell into proper position for applying solder flux to bus pad on collector side. When contact bus pad is in correct position, capstan drive is disengaged, and vacuum holddown beneath cell is turned on. Flux system lowers and applies preset amount of solder flux to bus pad. Two interconnect tabs are soldered to fluxed areas.

B81-10344
TAB INTERCONNECT WORK STATION
G. GARWOOD (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15505 **Vol. 6, No. 3, P. 336**
Second work station along solar-array assembly line automatically attaches two interconnect tabs to each silicon solar cell. Machine feeds, forms, and cuts tabs from reel of pretinned metal ribbon, transfers tabs into position, and solders them to cell.

B81-10345
WORK STATION FOR INVERTING SOLAR CELLS
H. FEDER (Kulicke & Soffa Industries, Inc.) and W. FRASCH (Kulicke & Soffa Industries, Inc.)

Dec. 1982
NPO-15506 **Vol. 6, No. 3, p. 337**

Final work station along walking-beam conveyor of solar-array assembly line turns each pretabbed solar cell over, depositing it back-side-up onto landing pad, which centers cell without engaging collector surface. Solar cell arrives at inverting work station collector-side-up with two interconnect tabs attached to collector side. Cells are inverted so that second soldering operation takes place in plain view of operator. Inversion protects collector from damage when handled at later stages of assembly.

B81-10346
SOLAR-CELL STRING CONVEYOR
W. FRASCH (Kulicke & Soffa Industries, Inc.) and S. CIAVOLA (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15508 **Vol. 6, No. 3, P. 337**

String-conveyor portion of solar-array assembly line holds silicon solar cells while assembled into strings and tested. Cells are transported collector-side-down, while uniform cell spacing and registration are maintained. Microprocessor on machine controls indexing of cells.

B81-10347
BONDER FOR SOLAR-CELL STRINGS
G. GARWOOD (Kulicke & Soffa Industries, Inc.) and W. FRASCH (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15507 **Vol. 6, No. 3, P. 338**

String bonder for solar-cell arrays eliminates tedious manual assembly procedure that could damage cell face. Vacuum arm picks up face-down cell from cell-inverting work station and transfers it to string conveyor without changing cell orientation. Arm is activated by signal from microprocessor.

B81-10348
TRANSPORTING SOLAR-CELL STRINGS
M. BYCER (Kulicke & Soffa Industries, Inc.) and W. FRASCH (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15502 **Vol. 6, No. 3, P. 339**

Vacuum 'lance' picks up assembled chain of solar cells from string conveyor without disturbing cells or interconnecting tabs. Lance has 2 vacuum pickups per cell, for total of up to 32 pickups. Positions and number of pickups can be varied. Lance can be adjusted for range of cell sizes, shapes, and spacings.

B81-10349
TRANSFER OF STRINGS TO THE MODULE FIXTURE
W. FRASCH (Kulicke & Soffa Industries, Inc.)
Dec. 1982
NPO-15509 **Vol.6, No. 3, P. 340**

Work station for transferring entire strings of solar cells places successive strings alined, with offset, or reversed end for end. Thus, various solar module formats can be accommodated. Two vacuum cups hold each solar cell in string being transferred.

B81-10350
ULTRASONIC WELDING OF GRAPHITE/THERMOPLASTIC COMPOSITE
S. S. HARDY (General Dynamics Corp.) and D. B. PAGE (General Dynamics Corp.)
Dec. 1982
MSC-20013 **Vol. 6, No. 3, P. 340**

Ultrasonic welding of graphite/thermoplastic composite materials eliminates need for fasteners (which require drilling or punching, add weight, and degrade stiffness) and can be totally automated in beam fabrication and assembly jigs. Feasibility of technique has been demonstrated in laboratory tests which show that neither angular orientation nor vacuum affect weld quality.

B81-10351
INCREASING METAL FRACTURE TOUGHNESS
P. L. LAWING, W. H. WOOD, and P. G. J. SANDEFUR
Dec. 1982 See Also NASA CR-165745(N81-30251/NSP)
LAR-12805 **Vol. 6, No. 3, P. 341**

In technique developed at Langley Research Center several thin sheets of metal are diffusion-brazed together in vacuum furnace to create thick piece of metal that retains much of fracture toughness of its thin components. Technique is expected to make many of high-strength stainless steels, not currently suitable, usable at cryogenic temperatures.

B81-10352
CONTROLLING ELECTRON-BEAM-WELD FOCUS
F. M. COATE (Rockwell International Corp.)
Dec. 1982
MFS-19635 **Vol. 6, No. 3, P. 342**

Control loop measures weld-spot temperature to regulate focus current. Square-wave generator modulates current in electron-beam focus coil so that focal point is varied between points slightly above and below surface of weld. Sensor detects intensity of light emitted by weld, proportional to fourth power of temperature at hottest part of weld spot. Sensor signal is detected by chopper demodulator synchronized by square-wave generator, to determine whether average position of focal point is higher than, coincident with, or lower than optimum point; and focus coil current is adjusted accordingly.

B81-10353
PLASMA SPRAY FOR DIFFICULT-TO-BRAZE ALLOYS
A. BRENNAN (Rockwell International Corp.)
Dec. 1982
MFS-19630 **Vol. 6, No. 3, P. 343**

Nickel plating on surfaces makes brazing easier for some alloys. Sometimes nickel plating may not be feasible because of manufacturing sequence, size of hardware, or lack of suitable source for nickel plating. Alternative surface preparation in such cases is to grit-blast surface lightly and then plasma-spray 1 1/2 to 2 mils of fine nickel powder or braze-alloy material directly on surface. Powder is sprayed from plasma gun, using argon as carrier gas to prevent oxidation of nickel or braze alloy.

B81-10354
WELD WIDTH INDICATES WELD STRENGTH
A. C. J. NUNES, H. L. NOVAK, and M. C. MCLLWAIN
Dec. 1982
MFS-25648 **Vol. 6, No. 3, P. 344**

Width of butt weld in 2219-T87 aluminum has been found to be more reliable indicator of weld strength than more traditional parameters of power input and cooling rate. Yield stress and ultimate tensile strength tend to decrease with weld size. This conclusion supports view of many professional welders who give priority to weld geometry over welding energy or cooling rate as indicator of weld quality.

B81-10355
CLEANING INTERNAL-WELD SPLATTER
R. SNODGRASS (Parker Hannifin Corp.)
Dec. 1982
MSC-20068 **Vol. 6, No. 3, P. 345**

Splattered metal produced by welding can be easily removed from inaccessible areas by method resembling ball milling. Hard steel balls are vibrated inside welded unit so that they 'scrub away' excess metal on interior side of weld joint.

B81-10356
ELIMINATING DELAMINATION IN CURVED COMPOSITE PARTS
G. T. SMITH (Rockwell International Corp.)
Dec. 1982
MSC-20027 **Vol. 6, No. 3, P. 345**

New way of laminating curved graphite/epoxy parts prevents delamination and porosity. Originally developed for a sharply-curved expansion joint frame on Space Shuttle payload-bay doors, new method may also be useful in constructing laminated parts for boat hulls or small aircraft. Method employs shims strategically positioned in layup of graphite/ epoxy tape. Shims allow for extra length in layup plies. On final cure, added length compensates for shrinkage that would otherwise have caused delamination.

B81-10357
IMPROVING RADIOMETER-CAVITY ABSORPTANCE
R. C. WILSON (CALTECH)
Dec. 1982
NPO-15374 **Vol. 6, No. 3, P. 346**

In improved cavity radiometer, each sensor cone ends in small tube so that black paint cannot form truncating meniscus. Inner diameter of tube is 0.25 mm; its outer diameter is 0.5 mm. During painting process, excess paint is drawn out through tube, preventing formation of meniscus at apex. After paint is cured, end of tube is crimped shut to form effective light trap.

B81-10358
ELECTRICALLY-CONDUCTIVE LOW-PERMEABILITY PRESSURE SEAL
H. C. KRIEG (TRW, Inc.)
Dec. 1982
MSC-20022 **Vol.6, No. 3, p. 346**

Metal-plated butyl rubber seal has been devised for enclosures of electronic equipment that must be maintained under dry, inert atmosphere. Seal prevents gas leakage over prolonged periods, while conductivity suppresses electromagnetic emissions from sealed equipment. Seal is formed by depositing aluminum or gold onto molded-in-place butyl rubber gasket and surrounding areas of flange.

B81-10359
CLAMP AND GAS NOZZLE FOR TIG WELDING
G. B. GUE (AMETEK) and H. L. GOLLER (AMETEK)
Dec. 1982
MSC-20108 **Vol. 6, No. 3, P. 347**

Tool that combines clamp with gas nozzle is aid to tungsten/inert-gas (TIG) welding in hard-to-reach spots. Tool holds work to be welded while directing a stream of argon gas at weld joint, providing an oxygen-free environment for tungsten-arc welding.

B81-10360
ACOUSTIC EMISSIONS COULD INDICATE WELD QUALITY
P. E. GUSTAFSON (Honeywell, Inc.) and F. S. SUTCH (Honeywell, Inc.)
Dec. 1982
MFS-25441 **Vol. 6, No. 3, P. 348**

Preliminary tests show quality of welds can be assessed by acoustic-emission monitor mounted on welder. Nondestructive measurement technique allows operator to determine uniformity and integrity of weld as being made, evaluate equipment performance and condition, and initiate corrective action if quality is not satisfactory.

B81-10361
INTEGRAL FACE SHIELD CONCEPT FOR FIREFIGHTER'S HELMET
F. ABELES (Grumman Aerospace Corp.), E. HANSBERRY (Grumman Aerospace Corp.), and V. HIMEL (Grumman Aerospace Corp.)
Dec. 1982
MFS-25493 **Vol. 6, No. 3, P. 348**

Stowable face shield could be made integral part of helmet worn by firefighters. Shield, made from same tough clear plastic as removable face shields presently used, would be pivoted at temples to slide up inside helmet when not needed. Stowable face shield, being stored in helmet, is always available, ready for use, and is protected when not being used.

B81-10362
RADIANT HEATING OF AMPOULE CONTENTS
L. R. HOLLAND (Athens State College)
Dec. 1982
MFS-25436 **Vol. 6, No. 3, P. 349**

Ampoule charge heating system exploits spectral properties of blackbody radiation and ampoule material transparency to heat charge to high temperature. Cooling gas prevents softening of outside wall of ampoule. Use of proposed method may be limited by tendency of silica (or any other viteous material) to devitrify on prolonged exposure to temperatures near softening point.

B81-10363
YIELDING TORQUE-TUBE SYSTEM REDUCES CRASH INJURIES
D. G. MCSMITH
Dec. 1982
LAR-12801 **Vol. 6, No. 3, P. 350**

Yielding torque-tube system minimizes injuries by limiting load transferred to occupant in crash. When properly integrated into seat structure, torque tube yields in plastic deformation stage of material and maintains a relatively constant resistance to applied torque for many degrees of rotation. Yielding torque-tube system is expected to find application in aircraft and automobile industries.

B81-10364
MONITORING CRYSTAL GROWTH FROM SOLUTION
R. B. LAL (Alabama Agriculture and Mechanical University)
Dec. 1982
MFS-25622 **Vol. 6, No. 3, P. 351**

Experimental system for monitoring growth of triglycine sulfate (TGS) crystals from solution is being studied. System consists of outer cell containing distilled water heated and stirred to maintain constant temperature to within plus or minus 0.1 degrees C, inner (growth) cell containing supersaturated solution of TGS, and seed crystal mounted in plastic-covered stainless-steel sting equiped with controlled cooling mechanism and temperature sensors.

B81-10365
INFRARED-CONTROLLED WELDING OF SOLAR CELLS
R. PAULSON (Lockheed Missiles & Space Co., Inc.), S. E. FINNELL (Lockheed Missiles & Space Co., Inc.), H. J. DECKER (Lockheed Missiles & Space Co., Inc.), and J. R. HODOR (Lockheed Missiles & Space Co., Inc.)
Dec. 1982
MFS-25612 **Vol. 6, No. 3, P. 351**

Proposed apparatus for welding large arrays of solar cells to flexible circuit substrates would sense infrared emission from welding spot. Emission would provide feedback for control of welding heat. Welding platform containing optical fibers moves upward through slots in movable holding fixture to contact solar cells. Fibers pick up infrared radiation from weld area.

B81-10366
STORING AND DEPLOYING SOLAR PANELS
D. L. BROWNING (General Dynamics Corp.), H. M. STOCKER (General Dynamics Corp.), and E. H. KLEIDON (General Dynamics Corp.)
Dec. 1982
MSC-18950 **Vol. 6, No. 3, P. 352**

Like upward-drawn window shades, solar blankets are unfurled to length of 89m, almost filling opening in 95.59-meter-square frame. When frame is completely assembled, solar blankets are pulled from canisters, one by one by electric motor. A Thin cushion sheet is rolled up with each blanket to cushion solar cells. Sheet is taken up on roller as blanket is unfurled. Unrolling proceeds automatically.

B81-10367
CUTTING A TAPERED EDGE ON PADDING MATERIAL
M. J. MITCHELL (Rockwell International Corp.)
Dec. 1982
MSC-20011 **Vol. 6, No. 3, P. 353**
Resilience and flexibility of felt, rubber, or other padding materials allow them to be clamped in form block, cut straight down, and then released to produce straight clean tapered edge. With material held in slanted position, edge can be cut straight down; hence cut depth is minimum.

B81-10368
PIVOT ATTACHMENT FOR PREFABRICATED BEAMS
H. W. J. STROLL (University of Wisconsin)
Dec. 1982
MFS-25476 **Vol. 6, No. 3, P. 354**
Assembly of prefabricated structural beams for roof trusses, bleachers, or other lightweight structures made easier by use of flexural pivot at one or both ends. When pivot is attached, joint is flexible, thus simplifying alinement; joint is subsequently rigidized by threaded collar that completes attachment.

B81-10369
FABRICATING STRUCTURAL BEAMS
E. E. ENGLER (Grumman Aerospace Corp.), J. EHL (Grumman Aerospace Corp.), W. MUENCH (Grumman Aerospace Corp.), H. MORFIN (Grumman Aerospace Corp.), J. HUBER (Grumman Aerospace Corp.), R. BRAUN (Grumman Aerospace Corp.), W. MARX (Grumman Aerospace Corp.), A. ALBERI (Grumman Aerospace Corp.), R. ROMANECK (Grumman Aerospace Corp.), C. JOHNSON (Grumman Aerospace Corp.) et al
Dec. 1982
MFS-25228 **Vol. 6, No. 3, P. 354**
Automatic machine described in new report has demonstrated on Earth feasibility of machine fabricating beams for huge structures in space. Such structures include solar mirrors, radiometer reflectors, microwave power transmitters, solar-thermal power generators, and solar photoelectric generators, ranging in size from few hundred meters long to tens of kilometers long.

09 MATHEMATICS AND INFORMATION SCIENCES

B81-10117
LINEAR-ALGEBRA PROGRAMS
C. L. LAWSON (CALTECH), F. T. KROGH (CALTECH), S. S. GOLD (CALTECH), D. R. KINCAID (University of Texas), J. SULLIVAN (University of Texas), E. WILLIAMS (University of Texas), R. J. HANSON (Sandia Laboratories), K. HASKELL (Sandia Laboratories), J. DONGARRA (Arrgonne National Laboratory), and C. B. MOLER (University of New Mexico)
Sep. 1982
NPO-15108 **Vol. 6, No. 1, P. 113**
The Basic Linear Algebra Subprograms (BLAS) library is a collection of 38 FORTRAN-callable routines for performing basic operations of numerical linear algebra. BLAS library is portable and efficient source of basic operations for designers of programs involving linear algebriac computations. BLAS library is supplied in portable FORTRAN and Assembler code versions for IBM 370, UNIVAC 1100 and CDC 6000 series computers.

B81-10118
I/O ERROR ANALYZER (UNIVAC 1108 VERSION)
E. T. VAUGHAN
Sep. 1982
GSC-12621 **Vol. 6, No. 1, P. 113**
IOALZ4 is an Assembly-language utility program for UNIVAC 1108, operational under level 33 of EXEC 8 operating system. It scans user-selected portions of system log file, whether located on tape or mass storage, searching for and processing I/O error entries.

B81-10246
CALCULATING THE PERFORMANCE OF A SOLAR REFLECTOR
M. K. SELCUK (CALTECH)
Nov. 1982
NPO-15314 **Vol.6, No. 2, P. 235**
New method calculates efficiency and useful heat of parabolic solar concentrator. Method uses three-part nomogram, consisting of a main chart and two other components. User enters the nomogram using known factors, then proceeds to plot lines to intercepts on nomogram to find results.

B81-10247
PROGRAM STRUCTURE COMBINES SEGMENTATION AND DYNAMIC STORAGE
S. H. TIFFANY (Kentron International, Inc.)
Nov. 1982 See Also NASA CR-3315(N80-31071/NSP)
LAR-12830 **Vol. 6, No. 2, P. 236**
Programing techniques incorporate advantages of overlaying into segmented loads while retaining all dynamic load advantages of segmentation, employing those capabilities that best suit mode of operation, whether batch or interactive. User is allowed to load a program automatically in a variable manner, based solely on a single data input to the program, to maintain minimal field lengths for interactive use.

B81-10370
NUMERICAL SOLUTION FOR NAVIER-STOKES EQUATIONS
Z. U. A. WARSI (Mississippi State University), R. A. WEED (Mississippi State University), and J. F. THOMPSON (Mississippi State University)
Dec. 1982
MFS-25617 **Vol. 6, No. 3, P. 357**
Carefully selected blend of computational techniques solves complete set of equations for viscous, unsteady, hypersonic flow in general curvilinear coordinates. New algorithm has tested computation of axially directed flow about blunt body having shape similar to that of such practical bodies as wide-body aircraft or artillery shells. Method offers significant computational advantages because of conservation-law form of equations and because it reduces amount of metric data required.

B81-10371
USER DOCUMENTATION FOR MULTIPLE SOFTWARE RELEASES
R. HUMPHREY (International Business Machines Corp.)
Dec. 1982
KSC-11189 **Vol. 6, No. 3, P. 358**
In proposed solution to problems of frequent software releases and updates, documentation would be divided into smaller packages, each of which contains data relating to only one of several software components. Changes would not affect entire document. Concept would improve dissemination of information regarding changes and would improve quality of data supporting packages. Would help to insure both timeliness and more thorough scrutiny of changes.

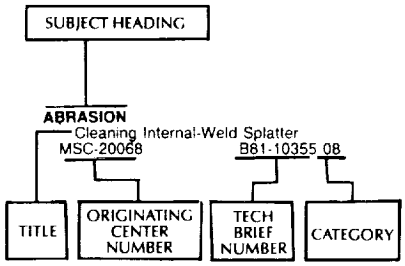
B81-10372
PROPOSED RELIABILITY/COST MODEL
L. M. DELIONBACK
Dec. 1982 See Also NASA TMX-64777(N73-32372/NSP)
MFS-25494 **Vol. 6, No. 3, P. 359**
New technique estimates cost of improvement in

reliability for complex system. Model format/approach is dependent upon use of subsystem cost-estimating relationships (CER's) in devising cost-effective policy. Proposed methodology should have application in broad range of engineering management decisions.

B81-10373
COMPUTING THE POWER-DENSITY SPECTRUM FOR AN ENGINEERING MODEL
H. J. DUNN
Dec. 1982 See Also NASA TM-83120(N81-25699/NSP)
LAR-12918 **Vol. 6, No. 3, P. 360**

Computer program for calculating of power-density spectrum (PDS) from data base generated by Advanced Continuous Simulation Language (ACSL) uses algorithm that employs fast Fourier transform (FFT) to calculate PDS of variable. Accomplished by first estimating autocovariance function of variable and then taking FFT of smoothed autocovariance function to obtain PDS. Fast-Fourier-transform technique conserves computer resources.

Typical Subject Index Listing



The title of each Tech Brief is listed under several selected subject headings to provide the user with a variety of approaches in his search for specific information. The Tech Brief number, e.g., B81-10316, is located under and to the right of the title and is followed by a two-digit number, e.g., 06, which designates the subject category in which the entire entry can be found.

A

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MSC-18782 B81-10164 04
ABRASION
Cleaning Internal-Weld Splatter
MSC-20068 B81-10355 08
ABSORBERS (MATERIALS)
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Pulsed Phase-Locked-Loop Strain Monitor
LAR-12772 B81-10068 06
Sound-burst Generator for Measuring Coal Properties
MFS-25438 B81-10281 04
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MFS-25441 B81-10360 08
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NPO-15413 B81-10055 06
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NPO-15523 B81-10279 04
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LEW-13730 B81-10298 06
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Double-Adhesive Tape Test Reduces Waste
MSC-20047 B81-10312 06
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KSC-11182 B81-10242 08
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LAR-12775 B81-10040 04
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MSC-18916 B81-10078 07
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KSC-11209 B81-10178 05
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GSC-12680 B81-10074 06
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GSC-12680 B81-10074 06
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ARC-11150 B81-10075 06
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LAR-12747 B81-10200 06
Algorithm for Unsteady Potential Flow About Airfoils
ARC-11378 B81-10316 06
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NPO-14940 B81-10188 06
AIR PURIFICATION
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AIRCRAFT DESIGN
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MSC-18982 B81-10017 02
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LAR-12857 B81-10199 06
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Improved Magnetic-Field-Component Resolvers
LAR-12638 B81-10299 06
Simple Magnetometer for Autopilots
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MFS-25506 B81-10080 07
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ARC-11378 B81-10316 06
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NPO-15108 B81-10117 09
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MSC-18498 B81-10013 02
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LAR-12814 B81-10179 06
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MFS-19632 B81-10328 07
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MFS-19629 B81-10283 04
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LEW-13745 B81-10311 06
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AMPLIFIER DESIGN
Log-Output Signal Processor Scans Eight Decades
ARC-11293 B81-10010 01
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GSC-12646 B81-10248 01
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GSC-12567 B81-10255 01
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Radiant Heating of Ampoule contents
MFS-25436 B81-10362 08
ANALOG CIRCUITS
Resistors Improve Ramp Linearity
GSC-12635 B81-10005 01
ANALYSIS (MATHEMATICS)
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MFS-25410 B81-10058 06
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NPO-15108 B81-10117 09
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MSC-18905 B81-10329 07
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High-Speed Laser Anemometer
LEW-13527 B81-10050 06
ANGLES (GEOMETRY)
New Apparatus Tests Pressure-Suit Joints
ARC-11314 B81-10314 06
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Efficient Energy-Storage Concept
MFS-25331 B81-10138 03
ANGULAR VELOCITY
Interferometer Accurately Measures Rotation Angle
GSC-12614 B81-10057 06
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NPO-15417 B81-10143 03
Modular Amplifier/Antenna Arrays
MSC-18981 B81-10258 01
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Unequal-Split Strip-Line Power Divider
LAR-12797 B81-10250 01
ANTENNA FEEDS
Sealed Strip Line for Extreme Temperatures
MSC-16994 B81-10114 08
Unequal-Split Strip-Line Power Divider
LAR-12797 B81-10250 01
ANTENNA RADIATION PATTERNS
Far-Field Antenna Pattern From a Near-Field Test
NPO-14905 B81-10059 06
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LAR-12784 B81-10004 01
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NPO-15448 B81-10241 08
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Magnetic Bearing Consumes Low Power
GSC-12517 B81-10202 07
Magnetic Bearing With Active Control
GSC-12582 B81-10203 07
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Surface Seal for Carbon Parts
MSC-18898 B81-10163 04
ANTIREFLECTION COATINGS
Effects of High Temperature on Collector Coatings
MFS-25651 B81-10148 03
ARC DISCHARGES
Arc-Free High-Power dc Switch
MSC-20091 B81-10256 01
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Electrochemical Assay of Gold-Plating Solutions
MFS-19639 B81-10284 04
ASSEMBLING
Ball-and-Socket Joint Can Be Disassembled
LAR-12770 B81-10084 07
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NPO-15501 B81-10340 08
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NPO-15503 B81-10341 08
Orienting and Applying Flux to Solar Cells
NPO-15504 B81-10343 08
Tab Interconnect Work Station
NPO-15505 B81-10344 08
Work Station For Inverting Solar Cells
NPO-15506 B81-10345 08
Solar-Cell String Conveyor
NPO-15508 B81-10346 08
Bonder for Solar-Cell Strings
NPO-15507 B81-10347 08
Transporting Solar-Cell Strings
NPO-15502 B81-10348 08
Transfer of Strings to the Module Fixture
NPO-15509 B81-10349 08
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A Simple Tiltmeter
ARC-11344 B81-10325 07
AUGMENTATION
Force Augmentation for Relief Valve
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AUTOMATIC CONTROL
Simpler Variable-Speed Drive for Fan or Pump
GSC-12643 B81-10201 07
One Way of Testing a Distributed Processor
KSC-11123 B81-10263 02
Controlling Electron-Beam-Weld Focus
MFS-19635 B81-10352 08
AUTOMATIC GAIN CONTROL
Spike-Free Automatic Level Control
KSC-11170 B81-10006 01
AUTOMATIC PILOTS
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LAR-12832 B81-10300 06
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KSC-11065 B81-10129 02
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Controller Regulates Auxiliary Source for Solar Power
MFS-25637 B81-10133 02
AVIONICS
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MSC-18982 B81-10017 02
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Battle Keeps Solar Energy in Receiver
NPO-15387 B81-10023 03
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Explosively Actuated Opening for Rapid Egress
LAR-12624 B81-10319 06
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GSC-12550 B81-10331 07
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MFS-25624 B81-10339 07
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Ball-and-Socket Joint Can Be Disassembled
LAR-12770 B81-10084 07
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GSC-12567 B81-10255 01
BARRIER LAYERS
Improved High-Temperature Seal
MSC-18790 B81-10210 07
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Pressure Switch Is a Low Cost Battery Indicator
GSC-12679 B81-10067 06
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Beam Splitter Intensities Are Preselected
MFS-25312 B81-10019 03
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Rotating the Plane of Parallel Light Beams
ARC-11311 B81-10265 03
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NPO-14905 B81-10059 06
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MSC-18895 B81-10230 08
Fabricating Structural Beams
MFS-25228 B81-10369 08
BEARINGS
Magnetic Bearing Consumes Low Power
GSC-12517 B81-10202 07
Magnetic Bearing With Active Control
GSC-12582 B81-10203 07
Spring Support for Turbopump Rotor Bearing
MFS-19624 B81-10204 07

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ARC-11323 B81-10137 03
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Metal Sandwith Panel With Biaxially Corrugated Core
FRC-11026 B81-10112 08
Precise Restraightening of Bent Studs
MFS-19632 B81-10328 07
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Binders for Thermal-Control Coatings
MFS-25620 B81-10294 04
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NPO-14934 B81-10175 05
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ARC-11264 B81-10296 05
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Optical Memory Stores 10 12sup. Bits
MFS-25456 B81-10012 02
BLOOD PRESSURE
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ARC-11264 B81-10296 05
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Strain-Gaged Bolts Are Easily Prepared
MSC-18823 B81-10069 06
Precise Restraightening of Bent Studs
MFS-19632 B81-10328 07
Universal Assembly for Captive Bolts
MSC-18905 B81-10329 07
Safety Bolt Doubles as a Bushing-Removal Tool
MSC-20032 B81-10334 07
BONDING
Flame-Retardant Coating is Heat-Sealed
MSC-18382 B81-10168 04
New Method For Joining Stainless Steel to Titanium
MSC-18820 B81-10232 08
Air Bag Applies Uniform Bonding Pressure
KSC-11182 B81-10242 08
Tab Interconnect Work Station
NPO-15505 B81-10344 08
Bonder for Solar-Cell Strings
NPO-15507 B81-10347 08
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Predicting Tensile Strengths of Boron/Aluminum Composites
LEW-13745 B81-10311 06
BOUNDARY LAYER FLOW
Nozzle Modification Suppresses Flow Transients
MFS-19567 B81-10061 06
BOUNDARY LAYER SEPARATION
High-Lift Separated Flow About Airfoils
LAR-12853 B81-10324 06
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Numerical Solution for Navier-Stokes Equations
MFS-25617 B81-10370 09
BRAIN
Retractor Tool for Brain Surgery
MFS-25380 B81-10176 05
BRAKES (FOR ARRESTING MOTION)
Torque Simulator for Rotating Systems
LAR-12751 B81-10318 06
BRAZING
Fluxless Brazing of Large Structural Panels
LAR-12519 B81-10100 08
Low-Gold-Content Brazing Alloys
MFS-19629 B81-10283 04
Increasing Metal Fracture Toughness
LAR-12805 B81-10351 08
Plasma Spray for Difficult-To-Braze Alloys
MFS-19630 B81-10353 08
BRILLOUIN EFFECT
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LAR-12766 B81-10181 06
BROADBAND AMPLIFIERS
Wideband Amplifier With Subpicosecond Stability
GSC-12646 B81-10248 01
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Gas Diffusion in Fluids Containing Bubbles
NPO-15060 B81-10292 04
BUCKLING
Vibration Analysis With Finite Dynamic Elements
NPO-15087 B81-10320 06
Structural Design With Stress and Buckling Constraints
MFS-25234 B81-10322 06
BUS CONDUCTORS
'Ruggedized' Microcomputer Bus
GSC-12691 B81-10229 08
BUSHINGS
Safety Bolt Doubles as a Bushing-Removal Tool
MSC-20032 B81-10334 07
BUTT JOINTS
Microcomputer Checks Butt-Weld Accuracy
MFS-25557 B81-10062 06

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CABLES (ROPES)
Improved Cable Grip Reduces Wear
ARC-11318 B81-10214 07
CALIBRATING
Electronically Calibratable Clock
LAR-12654 B81-10122 01
CAMS
Cam-Design Torque Wrench
MFS-19586 B81-10206 07
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Compact Dual-Mode Microwave Antenna
LAR-12784 B81-10004 01
Algorithms Could Automate Cancer Diagnosis
MSC-18764 B81-10045 05
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Improved Air-Treatment Canister
MSC-18942 B81-10234 08
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IC Capacitors on Groups III-to-V Substrates
GSC-12543 B81-10109 08
CARBON
Coal as a Substitute for Carbon Black
NPO-15461 B81-10280 04
CARBON DIOXIDE REMOVAL
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MSC-18942 B81-10234 08
CARBON FIBERS
Circuit Counts Carbon Fibers
NPO-14940 B81-10188 06
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Fiber-Reinforced Slip Castings
ARC-11279 B81-10099 08
Low-Gravity Investigations in Cast-Iron Processing
MFS-25491 B81-10172 04
CATALYSTS
Catalyzing the Combustion of Coal
NPO-15456 B81-10282 04
CELLS (BIOLOGY)
Algorithms Could Automate Cancer Diagnosis
MSC-18764 B81-10045 05
CENTRIFUGAL PUMPS
Damping Vibration at an Impeller
MFS-19645 B81-10338 07
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ARC-11279 B81-10099 08
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LEW-13460 B81-10105 08
'SiAlON' Materials for Advanced Structural Applications
LEW-13671 B81-10173 04
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Study of Two Digital Charge-Coupled Devices
MFS-25606 B81-10128 02
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Processing PCM Data in Real Time
KSC-11131 B81-10262 02
One Way of Testing a Distributed Processor
KSC-11123 B81-10263 02
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Electrochemical Assay of Gold-Plating Solutions
MFS-19639 B81-10284 04
CHEMICAL INDICATORS
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MSC-18989 B81-10287 04
CHEMICAL REACTORS
Capacitively-Heated Fluidized Bed
NPO-14912 B81-10102 08
CHIPS
Contamination Control During Weld Repairs
MFS-19652 B81-10225 08
CIRCUIT BOARDS
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GSC-12691 B81-10229 08
CIRCUIT RELIABILITY
Study of Two Digital Charge-Coupled Devices
MFS-25606 B81-10128 02
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Aerial Infrared Photos for Citrus Growers
KSC-11209 B81-10178 05
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Device Acquires, Orients, and Clamps
MFS-25403 B81-10086 07

Clamp Restrains Pressure Line
KSC-11205 B81-10207 07
Improved Cable Grip Reduces Wear
ARC-11318 B81-10214 07
Air Bag Applies Uniform Bonding Pressure
KSC-11182 B81-10242 08
Boltless Seal for Electronic Housings
NPO-14818 B81-10249 01
Small Fixture Strains Composites for Environmental Tests
NPO-15062 B81-10302 06
New Configuration for Compression-Test Fixture
MSC-18723 B81-10306 06
Clamp and Gas Nozzle for TIG Welding
MSC-20108 B81-10359 08

CLEANING
Wire Whip Keeps Spray Nozzle Clean
MFS-25175 B81-10115 08
Vacuum Head Removes Sanding Dust
MSC-19526 B81-10215 07
Brushless Cleaning of Solar Panels and Windows
NPO-14922 B81-10333 07
Cleaning Internal-Weld Splatter
MSC-20068 B81-10355 08

CLEANLINESS
Surface-Contamination Inspection Tool for Field Use
MFS-25581 B81-10190 06
Contamination Control During Weld Repairs
MFS-19652 B81-10225 08
Detecting Contamination With Photoelectron Emission
MFS-25619 B81-10313 06

CLIPS
Boltless Seal for Electronic Housings
NPO-14818 B81-10249 01

CLOCKS
Electronically Calibratable Clock
LAR-12654 B81-10122 01

CLOSED ECOLOGICAL SYSTEMS
Protective Garment Ensemble
KSC-11203 B81-10222 08

CLOSURES
Boltless Seal for Electronic Housings
NPO-14818 B81-10249 01

COAL
EMR Gage Would Measure Coal Thickness Accurately
MFS-25555 B81-10139 03
Sound-burst Generator for Measuring Coal Properties
MFS-25438 B81-10281 04
Catalyzing the Combustion of Coal
NPO-15456 B81-10282 04

COAL UTILIZATION
Combustion of Coal/Oil/Water Slurries
NPO-15462 B81-10144 03
Coal as a Substitute for Carbon Black
NPO-15461 B81-10280 04

COATING
IC Capacitors on Groups III-to-V Substrates
GSC-12543 B81-10109 08

COATINGS
Plasma Deposition of Amorphous Silicon
NPO-14954 B81-10044 04
Effects of High Temperature on Collector Coatings
MFS-25651 B81-10148 03
Surface Seal for Carbon Parts
MSC-18898 B81-10163 04
Flame-Retardant Coating is Heat-Sealed
MSC-18382 B81-10168 04
Binders for Thermal-Control Coatings
MFS-25620 B81-10294 04
Thermal Polymerization of N-Butyl Acrylate
NPO-15010 B81-10295 04

COAXIAL CABLES
Sealed Strip Line for Extreme Temperatures
MSC-16994 B81-10114 08

COLD WORKING
Staking Tool for Hard Metals
MSC-20009 B81-10336 07

COLOR TELEVISION
Graphics-System Color-Code Interface
LAR-12646 B81-10014 02

COMBUSTION CHAMBERS
Two-Stage Combustor Reduces Pollutant Emissions
NPO-14911 B81-10042 04

COMBUSTION EFFICIENCY
Combustion of Coal/Oil/Water Slurries
NPO-15462 B81-10144 03
Staged Turbojet Engine Would Emit Less NO
ARC-10814 B81-10213 07
Catalyzing the Combustion of Coal
NPO-15456 B81-10282 04

COMBUSTION PHYSICS
Combustion of Coal/Oil/Water Slurries
NPO-15462 B81-10144 03
Modular Engine Instrumentation System
LEW-13729 B81-10315 06

COMMERCIAL ENERGY
Energy-Systems Economic Analysis
NPO-15097 B81-10035 03

COMMUNICATION CABLES
Integrated Structural and Cable Connector
LAR-12769 B81-10085 07

COMPARATORS
Fast Holographic Comparator
LAR-12509 B81-10132 02
Precise Phase Comparator for Nearly Equal Frequencies
GSC-12645 B81-10253 01

COMPARISON
Matching Dissimilar Graphical Scales
MSC-14864 B81-10240 08

COMPOSITE MATERIALS
Lacquer Reveals Impact Damage in Composites
LAR-12700 B81-10064 06
Improved Cure-in-Place Silicone Adhesives
MSC-18782 B81-10164 04
Moisture in Composites is Measured by Positron Lifetime
LAR-12776 B81-10180 06
Boron/Aluminum-Titanium on Stiffener
MSC-18895 B81-10230 08
Composite-Material Point-Stress Analysis
MSC-18978 B81-10245 08
Coal as a Substitute for Carbon Black
NPO-15461 B81-10280 04
Graphite-Fiber-Reinforced rix Composite
LAR-12764 B81-10293 04
Ultrasonic Instrument for Evaluation of Composites
LEW-13716 B81-10301 06
Small Fixture Strains Composites for Environmental Tests
NPO-15062 B81-10302 06
Predicting the Strengths of Angle-Plied Laminates
LEW-13733 B81-10309 06
Predicting Tensile Strengths of Boron/Aluminum Composites
LEW-13745 B81-10311 06
Ultrasonic Welding of Graphite/Thermoplastic Composite
MSC-20013 B81-10350 08
Eliminating Delamination in Curved Composite Parts
MSC-20027 B81-10356 08

COMPRESSION TESTS
New Configuration for Compression-Test Fixture
MSC-18723 B81-10306 06

COMPUTER COMPONENTS
'Ruggedized' Microcomputer Bus
GSC-12691 B81-10229 08
Programable Interface Handles Many Peripherals
KSC-11132 B81-10261 02

COMPUTER DESIGN
Array Processor Has Power and Flexibility
ARC-11292 B81-10130 02
Automatically Reconfigurable Computer
MFS-25455 B81-10131 02
Aerodynamics of Supersonic Aircraft
LAR-12857 B81-10199 06
CADAT Printed-Wiring-Board Designer
MFS-25464 B81-10244 08

COMPUTER GRAPHICS
Graphics-System Color-Code Interface
LAR-12646 B81-10014 02
Graphics for Finite-Element Analysis
LAR-12793 B81-10194 06

COMPUTER PROGRAMMING
Program Structure Combines Segmentation and Dynamic Storage
LAR-12830 B81-10247 09

COMPUTER PROGRAMS
Unsteady Subsonic Loadings Due to Control-Surface Motion
LAR-12802 B81-10073 06
I/O Error Analyzer (UNIVAC 1108 Version)
GSC-12621 B81-10118 09
Improved Numerical Differencing Analyzer
GSC-12671 B81-10197 06
Simplified Thermal Analyzer --VAX Version
GSC-12698 B81-10198 06

One Way of Testing a Distributed Processor
KSC-11123 B81-10263 02

COMPUTER STORAGE DEVICES
Optical Memory Stores 10 12sup. Bits
MFS-25456 B81-10012 02
Array Processor Has Power and Flexibility
ARC-11292 B81-10130 02

COMPUTER SYSTEMS PROGRAMS
I/O Error Analyzer (UNIVAC 1108 Version)
GSC-12621 B81-10118 09
User Documentation for Multiple Software Releases
KSC-11189 B81-10371 09

COMPUTERIZED SIMULATION
Powerplant Thermal-Pollution Models
KSC-11210 B81-10142 03

CONCAVITY
Gage for Surface Waviness
MSC-20055 B81-10305 06

CONCENTRATORS
Easily Assembled Reflector for Solar Concentrators
NPO-15518 B81-10235 08

CONDUCTIVE HEAT TRANSFER
Finite-Element Analysis of Forced Convection and Conduction
LAR-12794 B81-10195 06

CONNECTORS
Blind Fastener Is Easy To Install
MSC-18742 B81-10082 07
Unidirectional Flexural Pivot
GSC-12622 B81-10208 07

CONTACT RESISTANCE
Wire-Wrap Chatter Detector
NPO-15290 B81-10121 01

CONTAINERLESS MELTS
Levitator for Containerless Processing
MFS-25509 B81-10110 08
Materials Processing in Space
MFS-25544 B81-10116 08

CONTAMINANTS
Refractories Keep Silicon Crystals Pure
NPO-14820 B81-10095 08

CONTAMINATION
Removing Defects From Silicon Ribbon
NPO-14772 B81-10091 08
Ceramic for Silicon-Shaping Dies
NPO-14783 B81-10092 08
Speedy Acquisition of Surface-Contamination Samples
NPO-14934 B81-10175 05
Circuit Counts Carbon Fibers
NPO-14940 B81-10188 06
Surface-Contamination Inspection Tool for Field Use
MFS-25581 B81-10190 06
Contamination Control During Weld Repairs
MFS-19652 B81-10225 08
Detecting Contamination With Photoelectron Emission
MFS-25619 B81-10313 06

CONTROL EQUIPMENT
Three-Phase Power Factor Controller
MFS-25535 B81-10001 01
Load-Responsive Motor Controller
MFS-25560 B81-10002 01
Power-Factor Controller With Regenerative Braking
MFS-25477 B81-10003 01
Spike-Free Automatic Level Control
KSC-11170 B81-10006 01
Hybrid Position/Force Control of Robot Manipulators
NPO-14997 B81-10327 07

CONTROL SURFACES
Unsteady Subsonic Loadings Due to Control-Surface Motion
LAR-12802 B81-10073 06

CONTROL UNITS (COMPUTERS)
Programable Interface Handles Many Peripherals
KSC-11132 B81-10261 02

CONTROLLED ATMOSPHERES
Environmental-Analysis Routine Library
MSC-18925 B81-10297 05

CONVECTIVE HEAT TRANSFER
Finite-Element Analysis of Forced Convection and Conduction
LAR-12794 B81-10195 06

CONVEXITY
Gage for Surface Waviness
MSC-20055 B81-10305 06

CONVEYORS
Walking-Beam Solar-Cell Conveyor
NPO-15503 B81-10341 08
Work Station For Inverting Solar Cells
NPO-15506 B81-10345 08
Solar-Cell String Conveyor
NPO-15508 B81-10346 08

COOLING
Modular Amplifier/Antenna Arrays
MSC-18981 B81-10258 01

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NPO-15523 B81-10279 04

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MFS-19629 B81-10283 04

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MSC-18868 B81-10079 07

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NPO-15520 B81-10171 04

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NPO-15097 B81-10035 03
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MFS-25682 B81-10153 03
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MFS-25683 B81-10154 03
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MFS-25391 B81-10278 03

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KSC-11132 B81-10261 02
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MSC-18742 B81-10082 07
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MSC-18923 B81-10220 07
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MFS-25476 B81-10368 08

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MSC-18865 B81-10170 04

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MFS-19575 B81-10054 06

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LEW-13745 B81-10311 06

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GSC-12412 B81-10047 05
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NPO-15213 B81-10048 05

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NPO-14967 B81-10089 08
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NPO-14819 B81-10090 08

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NPO-14980 B81-10093 08
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NPO-14859 B81-10094 08

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NPO-15476 B81-10166 04

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LAR-12728 B81-10076 07
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NPO-14819 B81-10090 08
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NPO-14772 B81-10091 08
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NPO-14783 B81-10092 08
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NPO-14980 B81-10093 08
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NPO-15487 B81-10097 08
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MFS-25341 B81-10098 08
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MFS-25544 B81-10116 08
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MFS-25622 B81-10364 08

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NPO-14968 B81-10285 04

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ARC-11264 B81-10296 05

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NPO-15463 B81-10332 07
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NPO-14324 B81-10136 03

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GSC-12680 B81-10074 06

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KSC-11132 B81-10261 02
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MSC-19526 B81-10215 07
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NPO-15438 B81-10219 07
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NPO-14954 B81-10044 04

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MFS-25555 B81-10139 03
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MFS-25438 B81-10281 04

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LAR-12814 B81-10179 06

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LAR-12700 B81-10064 06
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MSC-20105 B81-10310 06

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NPO-14939 B81-10020 03

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MSC-18904 B81-10191 06

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MFS-25576 B81-10165 04
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NPO-15060 B81-10292 04
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MFS-25599 B81-10260 02
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GSC-12691 B81-10229 08
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MFS-19644 B81-10289 04
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MFS-25546 B81-10088 08
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NPO-14912 B81-10102 08

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MSC-18885 B81-10046 05
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NPO-15487 B81-10097 08
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MSC-18885 B81-10046 05
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LAR-12519 B81-10100 08
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GSC-12649 B81-10317 06

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ORIFICES
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MSC-18895 B81-10230 08
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MSC-18868 B81-10079 07
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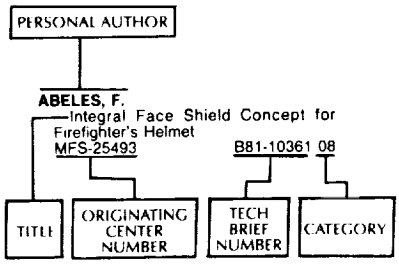

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NPO-14968 B81-10285 04
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LAR-12613 B81-10009 01
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NPO-14772 B81-10091 08
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NPO-15097 B81-10035 03
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NPO-15463 B81-10332 07
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LAR-12796 B81-10268 03
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MSC-18950 B81-10366 08
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LAR-12772 B81-10068 06
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MFS-19624 B81-10204 07
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MFS-25441 B81-10360 08
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LAR-12793 B81-10194 06
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LAR-12830 B81-10247 09
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KSC-11170 B81-10006 01
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MSC-18925 B81-10297 05
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MSC-18382 B81-10168 04
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LEW-13598 B81-10237 08
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WEINBERG, M. C.
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NPO-15060 B81-10292 04
WEINER, H.
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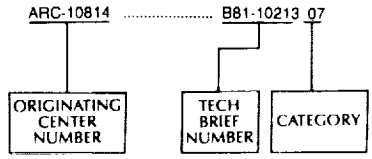

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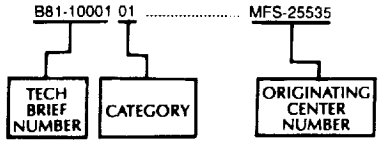

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B81-10293 04 ..... LAR-12764
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B81-10296 05 ..... ARC-11264
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